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PERFORMANCE SPECIFICATIONS FOR

TEXTILE FABRICS

FIRST EDITION • 1983

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ASTM STANDARD PERFORMANCE SPECIFICATIONS

for

TEXTILE FABRICS

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Under the jurisdiction of
ASTM SUBCOMMITTEE D13.56
On Performance Standards
for Textile Fabrics

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FOREWORD

The voluntary textile fabric performance standards published herein are under the jurisdiction of Committee D-13 on Textiles and are the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

This work by Subcommittee D13.56 is in many instances an extension and revision of the efforts made by the American National Standards Institute (ANSI) committee L22, established in 1940 at the request of the National Retail Merchants Association, and committee L24 sponsored by the American Hotel Association. In some cases, earlier versions of the L24 standards were under the L14 designation. ASTM Committee D-13 is grateful to L22 and L24 committee members for their important contributions over the years and deeply appreciates their continued contributions to the work of ASTM Committee D-13.

The standards published herein are intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of these standards does not in any respect preclude any party from manufacturing, selling, or using products or procedures not conforming to a standard.

Producers of textile fabrics made in conformance with an ASTM standard are encouraged to state on their own responsibility in advertising, promotional material, or on tags or labels, that the goods are produced in conformance with a particular ASTM standard. The inclusion of information concerning the characteristics covered by a standard in such advertising and promotion media, or on tags or labels is also encouraged.

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Designation: D 3477 – 81

Standard Performance Specification for
MEN'S AND BOYS' WOVEN DRESS SHIRT FABRICS[1]

This standard is issued under the fixed designation D 3477; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers woven fabrics to be used in the manufacturing of dress shirts for men and boys.

1.2 This performance specification is not applicable to woven fabrics used for interlinings.

1.3 These requirements apply to both the length and width directions for those properties where each fabric direction is pertinent.

1.4 When a fabric requires special treatment, specific methods will be described as they are developed for that material, and such special tests will have precedence over these general requirements.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Related to Textiles[2]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[3]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[3]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[3]

D 1905 Test for Dimensional Changes in Laundering of Woven or Knitted Fabrics[4]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[3]

D 2724 Testing Bonded and Laminated Apparel Fabrics[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

2.2 *AATCC Methods*:[5]

8	Colorfastness to Crocking: AATCC Crockmeter Method
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Evaluation Procedure 2	Gray Scale for Staining
Evaluation Procedure 3	AATCC Chromatic Transference Scale

3. Terminology

3.1 *Definitions*:

3.1.1 *dimensional change, n—in pressing and finishing of textiles,* the change in dimensions

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[1] This specification is under the jurisdiction of Committee D-13 on Textiles, and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved Feb. 27, 1981. Published July 1981. Originally published as D 3477 – 76. Last previous edition D 3477 – 76.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Discontinued, see *1977 Annual Book of ASTM Standards*, Part 32.

[5] AATCC Technical Manual, available from the American Association of Textiles Chemists and Colorists, P. O. Box 12215, Research Triangle Park, N. C. 27709.

of a fabric caused by pressing and finishing during garment manufacture.

3.1.2 For definitions of other textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Definitions D 123.

3.2 *Description of Term*:

3.2.1 *pressing and finishing*—this term takes into account all of the industrial pressing and finishing treatments used in garment production.

NOTE 1—No standard method is available for reproducing on a laboratory level the results of industrial press or finish treatments, or both, used in the manufacture of woven outerwear garments.[6]

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, woven fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: This fabric meets ASTM Specification D 3477 except for the following characteristic(s).

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer. Any "partially cured" or "post cured" fabrics should first be processed in accordance with the fabric manufacturer's instructions.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the true average (that is, a theoretical average from an infinite number of observations) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabric for men's and boys' woven dress shirts shall conform to the specification requirements in Table 1.

7. Test Methods

7.1 *Breaking Strength (Load)*—Determine the dry breaking strength (load), in accordance with the grab test procedure of Method D 1682, using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± 0.5 in. (305 ± 13 mm)/min.

NOTE 2—If preferred, use of a constant-rate-of-extension (CRE) tensile testing machine is permitted. The crosshead speed should be as agreed upon between the buyer and seller. However, in case of controversy, the CRT method shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage in accordance with Method D 434.

7.3 *Tear Strength*—Determine the tear strength in accordance with Method D 2262.

NOTE 3—If preferred, use of Method D 1424 is permitted with existing requirements as given in this standard. However, in case of controversy, Method D 2262 shall prevail.

7.4 *Dimensional Change*:

7.4.1 *Pressing During Manufacturing*—Mark the specimen(s) as directed in 4.3.1 of AATCC Method 135. Press the specimen(s) as agreed upon by the buyer and seller with respect to time, temperature, and the selection of dry or steam heat. Measure each specimen and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135 (see 3.2.1).

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[6] The development of a standard method has been referred to Subcommittee D13.59 on Fabric Test Methods, General.

7.4.2 *Laundering*—Determine the dimensional change in laundering of fabrics in accordance with AATCC Method 135 (Note 4). Use the same specimens and gage marks on which the shrinkage due to pressing was calculated. This will produce a total shrinkage (pressing and laundering) as would result from manufacturing pressing and subsequent laundering and pressing.

NOTE 4—Under this standard a washable fabric also shall be drycleanable unless specifically labeled "Do Not Dryclean." "Drycleanable" goods are to be drycleanable only.

7.4.2.1 The wash conditions and drying procedure shall be as specified by the seller. In the case of a non durable press fabric, press as specified in 12.1.4 of ASTM Method D 1905 before measuring shrinkage.

7.4.3 *Drycleaning*—Determine the dimensional change in drycleaning in accordance with 10.1.1 to 10.1.4 of Method D 2724 (Note 4).

7.5 *Colorfastness*:

7.5.1 *Laundering*—Determine the colorfastness to laundering in accordance with AATCC Method 61. The test conditions shall be as specified by the seller (Note 4).

7.5.2 *Drycleaning*—Determine the colorfastness to drycleaning in accordance with AATCC Method 132 (Note 4).

7.5.3 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric, after one washing cycle, in accordance with AATCC Method 23 (washing conditions shall be as for dimensional change in laundering) and after 1 dry cleaning.

7.5.4 *Crocking*—Determine the colorfastness to dry and wet crocking in accordance with AATCC Method 8 for solid shades or AATCC Method 116 for prints or as agreed between the purchaser and the seller.

7.5.5 *Perspiration*—Determine the colorfastness to perspiration in accordance with AATCC Method 15 (acid phase).

NOTE 5—Published work indicates that AATCC Method 15 (acid phase) predicts wear performance accurately and consistently.[7]

7.5.6 *Light*—Determine the colorfastness to light in accordance with AATCC Method 16A.

NOTE 6—There is a distinct difference in spectral distribution between the enclosed carbon-arc (not sunshine-carbon arc) and xenon fading lamp apparatus. Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. The xenon fading lamp apparatus may be used providing a prior agreement between the purchaser and the seller has been established.

7.6 *Fabric Appearance After Repeated Home Launderings*—Determine the fabric appearance in accordance with AATCC Method 124 under the conditions used in 7.4.2.

7.6.1 For fabrics not intended for use in "Durable Press" products determine the fabric appearance after pressing as specified in 12.1.4 of Method D 1905.

7.7 *Flammability*—Flammability characteristics must meet the requirements established and promulagated by the federal government.

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[7] See Gobeil, N. B., and Mueller, B. J., *Textile Chemist and Colorist*, Vol 6, p. 249, 1974.

TABLE 1 Specification Requirements

Characteristic	Requirements	Section
Breaking strength (load)	25 lbf (111 N), min	7.1
Yarn slippage	20 lbf (89 N), min	7.2
Tear strength	1.5 lbf (6.7 N), min	7.3
Dimensional change:		
Pressing	1 % max, in each direction	7.4.1
Pressing and laundering	2 % max, in each direction	7.4.2
Drycleaning	2 % max, in each direction	7.4.3
Colorfastness to:		
Laundering		
Alteration in shade	class 4,[A] min[D]	7.5.1
Staining	class 3,[B] min[D]	
Drycleaning		7.5.2
Alteration in shade	class 4,[A] min[D]	
Burnt Gas Fumes		7.5.3
Alteration in shade: 1 cycle on original, and after 1 washing or 1 drycleaning, or both	class 4,[A] min[D]	
Crocking		7.5.4
Dry	class 4,[C] min[D]	
Wet	class 3,[C] min[D]	
Perspiration (acid phase)		7.5.5
Alteration in shade	class 4,[A] min[D]	
Staining	class 4,[B] min[D]	
Light (20 AATCC SFU)	class 4,[A] min[D]	7.5.6
Fabric appearance	DP 3.5, min[D]	7.6
Flammability	pass	7.7

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] Class in colorfastness and DP requirements is based on a numerical rating of 5 for negligible or no color change, color transfer, or fabric wrinkle to a numerical rating of 1 for very severe color change, color transfer, or fabric wrinkle.

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Standard Performance Specification for
MEN'S AND BOYS' WOVEN DRESS TOPCOAT AND DRESS OVERCOAT FABRICS[1]

This standard is issued under the fixed designation D 3562; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers all men's and boys' woven dress topcoat and dress overcoat fabrics composed of any fiber or mixture of fibers.

1.2 This performance specification is not applicable to woven fabrics used for interlinings, rainwear, garments, and all-purpose, water-repellent garments.

1.3 These requirements apply to both the length and width directions for those properties where each fabric direction is pertinent.

1.4 When a fabric requires special treatment, specific methods will be described as they are developed for that material, and such special tests will have precedence over these general requirements.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[3]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[3]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[3]

D 1905 Test for Dimensional Changes in Laundering of Woven or Knitted Textiles[4]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[3]

D 2724 Testing Bonded and Laminated Apparel Fabrics[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

2.2 *AATCC Methods*:[5]

8-1972 Colorfastness to Crocking: AATCC Crockmeter Method

15-1973 Colorfastness to Perspiration

16A-1974 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E-1974 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23-1972 Colorfastness to Burnt Gas Fumes

116-1972 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124-1973 Appearance of Durable Press Fabrics after Repeated Home Launderings

132-1973 Colorfastness to Drycleaning

135-1973 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics

Evaluation Procedure 1 Gray Scale for Color Change

Evaluation Procedure 2 Gray Scale for Staining

Evaluation Procedure 3 AATCC Chromatic Transference Scale

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles, and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

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[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Discontinued, see *1977 Annual Book of ASTM Standards*, Part 32.

[5] AATCC Technical Manual, available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

NOTE 1—The specific dated editions of the tested methods that prevail in this document are referenced in Section 7.

3. Terminology

3.1 *Definitions*:

3.1.1 *dimensional change, n—in pressing and finishing of textiles,* the change in dimensions of a fabric caused by pressing and finishing during garment manufacture.

3.1.2 For definitions of other textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Definitions D 123.

3.2 *Description of Term*:

3.2.1 *pressing and finishing*—this term takes into account all of the industrial pressing and finishing treatments used in garment production.

NOTE 2—No standard method is available for reproducing on a laboratory level the results of industrial press or finish treatments, or both, used in the manufacture of woven outerwear garments.[6]

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, woven fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: This fabric meets ASTM Specification D 3562 except for the following characteristic(s).

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer. Any "partially cured" or "post cured" fabrics should first be processed in accordance with the fabric manufacturer's instructions.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Recommended Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the true average (that is, a theoretical average from an infinite number of observations) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for men's and boys' woven dress topcoats and dress overcoats shall conform to the specification requirements in Table 1.

7. Test Methods (Note 1)

7.1 *Breaking Strength (load)*—Determine the dry breaking strength (load) as directed in the grab test procedure of Methods D 1682 –64 (1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± 0.5 in. (305 ± 13 mm)/min.

NOTE 3—If preferred, the use of a constant-rate-of-extension (CRE) tensile testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. However, in case of controversy the CRT method shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434 – 75.

7.3 *Tongue Tear Strength*—Determine the tear strength as directed in Method D 2262 – 71.

NOTE 4—If preferred, use of Method D 1424 –63 (1975) is permitted with existing requirements as given in this standard. However, in case of controversy, Method D 2262 – 71 shall prevail.

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[6] The development of a standard method has been referred to Subcommittee D13.59 on Fabric Test Methods, General.

7.4 *Dimensional Change*:

7.4.1 *Pressing During Manufacturing*—Mark specimen(s) as directed in 4.3.1 of AATCC Method 135-1973. Press specimen(s) as agreed by the purchaser and the supplier with respect to time, temperature, and the selection of dry heat or steam. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135-1973 (see 3.2.1).

7.4.2 *Drycleaning*—Determine the maximum dimensional change in drycleaning as directed in 10.1 through 10.1.4 of Method D 2724 – 72.

Note 5—Specimens prepared for 7.4.2 may be used if desired. When this is done, subtract the pressing dimensional change from the total dimensional change to obtain that portion due to drycleaning.

7.5 *Colorfastness*:

7.5.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one drycleaning as in 7.4.2 as directed in AATCC Method 23-1975.

7.5.2 *Drycleaning*—Determine the colorfastness to drycleaning as directed in AATCC Method 132-1976.

7.5.3 *Crocking*—Determine the colorfastness to dry and wet crocking as directed in AATCC Method 8-1974 for solid shades or AATCC Method 116-1974 for prints, or as agreed between the purchaser and the supplier.

7.5.4 *Perspiration*—Determine the colorfastness to perspiration as directed in AATCC Method 15-1976 (acid phase).

7.5.5 *Light*—Determine the colorfastness to light as directed in AATCC Method 16A-1976 or AATCC Method 16E-1976.

Note 6—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1976 shall prevail.

7.6 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124-1975, after drycleaning as specified in 7.4.2.

7.6.1 For fabrics not intended for use in "Durable Press" garments, determine the fabric appearance after pressing as specified in 12.1.4 of Method D 1905 – 73.

7.7 *Flammability*—The flammability requirements shall be as agreed between the purchaser and the supplier, except when regulated by applicable government mandatory standards.

TABLE 1 **Specification Requirements**

Characteristic	Requirements	Section
Breaking strength (load)	30 lbf (133 N), min	7.1
Yarn slippage	25 lbf (111 N), min	7.2
Tear Strength	3 lbf (13 N), min	7.3
Dimensional Change:		
Pressing	2 % max shrinkage and 0 % growth in each direction	7.4.1
Drycleaning	2 % max shrinkage and 0 % growth in each direction	7.4.2
Colorfastness:		
Burnt gas fumes—1 cycle		
Shade change, original fabric	class 4,[A] min	7.5.1
Shade change, after 1 drycleaning	class 4,[A] min	
Drycleaning:		
Shade change	class 4,[A] min	7.5.2
Crocking:		
Dry	class 4,[C] min	7.5.3
Wet	class 3.5,[C] min	
Perspiration (acid phase):		7.5.4
Shade change	class 4,[A] min	
Staining	class 3.5,[B] min	
Light (40 ATCC SFU)	class 4,[A] min	7.5.5
Fabric Appearance:	D.P. 4, min	7.6
Flammability	pass	7.7

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Designation: D 3597 - 81

Standard Specification for
WOVEN UPHOLSTERY FABRICS—PLAIN, TUFTED OR FLOCKED[1]

This standard is issued under the fixed designation D 3597; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the performance requirements for plain, tufted, or flocked woven upholstery fabrics as used in the manufacture of new indoor furniture. These requirements apply to both the warp and filling directions for those factors where each fabric direction is pertinent.

1.2 This specification is not applicable to fabrics used in porch, deck, or lawn furniture; nor for knitted fabrics, bonded or laminated fabrics, or surface-coated fabrics (such as, vinyls and urethanes).

2. Applicable Documents

2.1 *ASTM Standards:*

D 123 Definitions of Terms Relating to Textiles[2]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[2]

D 1175 Tests for Abrasion Resistance of Textile Fabrics[2]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[2]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[2]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[2]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[2]

2.2 *Other Documents:*

AATCC 8-1974 Colorfastness to Crocking: AATCC Crockmeter Method[3]

AATCC 16A-1974 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light[3]

AATCC 16E-1976 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light[3]

AATCC 23-1975 Colorfastness to Burnt Gas Fumes[3]

AATCC 107-1975 Colorfastness to Water[3]

AATCC 116-1974 Colorfastness to Crocking:
Rotary Vertical Crockmeter Method[3]

AATCC 129-1975 Colorfastness to Ozone in the Atmosphere
Under High Humidities[3]

AATCC Gray Scale for Color Change, Evaluation Procedure 1[3]

AATCC Chromatic Transference Scale, Evaluation Procedure 3[3]

Specifications Standards Test Procedures for Upholstered Furniture Fabrics[4]

Guides for the Household Furniture Industry[5]

NOTE 1—The specific dated editions of the test methods that prevail in this document are referenced in Section 7 on Test Methods.

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[1] This specification is under the jurisdiction of ASTM committee D-13 on Textiles, and is the direct responsibility of Subcommittee D 13.56 on Performance Standards for Textile Fabrics.

Current edition approved Feb. 27, 1981. Published July 1981. Originally published as D 3597 - 7. Last previous edition D 3597 - 77.

[2] *Annual Book of ASTM Standards*, Part 32.

[3] AATCC Technical Manual, available from the American Association of Textile Chemists and Colorists, P. O. Box 12215, Research Triangle Park, N. C. 27709.

[4] Issued in 1969 by the National Association of Furniture Manufacturers, the Southern Furniture Manufacturer's Association, and the National Retail Furniture Association. Available from Southern Furniture Manufacturers Assn., P. O. Box 951, High Point, N. C. 27261.

[5] Available from the Bureau of Consumer Protection, Federal Trade Commission, Washington, D. C. 20580.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, woven fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: This fabric meets ASTM Specification D 3597 except for the following characteristic(s).

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Select the lot samples as specified in the applicable test methods. In the absence of such instructions in a specific test method, select the lot sample as agreed by the purchaser and the seller.

5.3 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens as directed in each of the applicable test method.

5.3.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the true average that is, a theoretical average from an infinite number of observations when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single operator precision.

6. Specification Requirements

6.1 The properties of woven upholstery fabrics (plain, tufted, or flocked) shall conform to the specification requirements in Table 1.

7. Test Methods (See Note 1)

7.1 *Breaking Strength* (*Load*) – Determine the breaking strength (load) in accordance with the Grab Test of Method D 1682-64 (1975) using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± ½ in. (305 ± 13 mm)/min.

NOTE 2 – If preferred, the use of a constant-rate-of-extension (CRE) tensile testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. However, in case of controversy the CRT method shall prevail.

7.2 *Tear Strength* – Determine the tear strength in accordance with Method D 2262-71.

NOTE 3 – If preferred, use of Method D 1424-63 (1975) is permitted with existing requirements as given in this standard. However, in case of controversy, method D 2262-71 shall prevail.

7.3 *Resistance to Yarn Slippage:*

7.3.1 Determine the resistance to yarn slippage in accordance with Method D 434-75. Regardless of the disclaimer found in 1.2 of Method D 434-75, this procedure is applicable with the following modifications.

7.3.2 Sew the seam using a minimum of seven and a maximum of eight stitches per inch (320 stitches per metre).

7.3.3 Use a chrome or nickel plated needle, 0.063 in. (1.60 mm) in diameter.[6]

7.3.4 Use a No. 24-4 hard finish "Z" twist white cotton sewing thread[7] as the needle thread. Use either hard or soft finish No. 24-4 "Z" twist white cotton sewing thread for the bobbin thread.

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[6] Singer No. 23 needle, or its equivalent has been found satisfactory for this method.

[7] Source, most suppliers of upholstery sewing thread.

7.4 *Surface Abrasion:*

7.4.1 Determine the surface abrasion in accordance with Method D 1175-71, using the Oscillatory Cylinder Method with the following modifications.

NOTE 4—The Oscillatory Cylinder Method of Method D 1175-71 is specified due to the historical usage of this method by furniture manufacturers; and one by which they have accumulated much data which, reportedly, has correlated with end-use performance in certain cases. Nonetheless, Section 5 of Method D 1175-71 states that the procedure is not recommended for acceptance testing. Consequently, the test requirements for this performance factor should be used with caution, in the knowledge that different fabrics will not always be ranked by this test in the same order as by actual abrasive wear which takes place on specific pieces of furniture.

7.4.2 Use a clean wire screen abradant, stainless steel, 50 by 70 mesh (210 by 297 μm), backed by a 14-mesh (1.4 by 1.4 mm) to an 18-mesh (1.0 by 1.0 mm) screen.

7.4.3 The tension of the specimen shall be 4 lbf (18 N) and the compression force shall be 3 lbf (13 N).

7.4.4 Test at least two specimens in the warp direction, and at least two in the filling direction.

7.4.5 At the end of 3000 cycles (double rubs) examine the specimens for loose threads and wear (slight discoloration from the stainless steel screen on light colored fabrics is disregarded). If no noticeable change is apparent, continue the test for another 6000 cycles (a total of 9000 cycles). Examine the specimen again. If no noticeable change is apparent, continue the test for another 6000 cycles (a total of 15,000 cycles).

NOTE 5—Loss of pigment and frosting are considered in evaluating wear. However, other changes in surface appearance or disturbance of the surface character without significant abrasive wear should be disregarded.

7.4.6 Classify fabrics that show no noticeable wear after 3000 cycles but show appreciable wear at 9000 cycles as light-duty. Classify fabrics that show no appreciable wear at 9000 cycles but appreciable wear at 15 000 cycles as medium-duty. Classify fabrics that show no noticeable wear at 15 000 cycles as heavy-duty.

7.5 *Dimensional Change:*

7.5.1 Determine dimensional change in accordance with Specifications Standards Test Procedures for Upholstered Furniture Fabrics, as follows:

NOTE 6—Test is not relevant if fabric is to be labeled "clean with solvent only."

7.5.2 *Procedure:*

7.5.2.1 Mark 12 by 12-in. (305 by 305-mm) test specimens with sets of three 10-in. (254-mm) gage distances in both the warp and the filling directions.

7.5.2.2 Place the marked specimens in a pan at least 14 by 14 by 6 in. (356 by 356 by 152 mm) containing a sufficient volume of 80 ± 5°F (26 ± 3°C) distilled or demineralized water to cover them completely in their fully opened flat state. The water should contain 0.05% (OWS) nonionic wetting agent.

7.5.2.3 After being completely submerged in the water for 10 ± 1 min, remove the specimens and individually lay them out flat on horizontal ventilated screens and allow them to dry in the prevailing room atmosphere (approximately 24 h). Do not extract or wring out the specimens prior to drying.

7.5.2.4 After drying, measure the distance between the gage marks in each fabric direction. Separately report the average dimensional change in the warp and the filling.

7.5.3 *Calculations*—Calculate the shrinkage or the gain as directed in Eqs 1 and 2;

$$S = [(A - B)/A] \times 100 \qquad (1)$$

$$G = [(B - A)/A] \times 100 \qquad (2)$$

where:

A = distance between gage marks before wetout, 10 in. (254 mm),

B = distance between gage marks after wetout and drying.

G = gain, %, and

S = shrinkage, %.

In reporting the gain, the percent change shall have the prefix +.

7.6 *Colorfastness to Water:*

NOTE 6—Test is not relevant if fabric is to be labeled "clean with solvent only."

7.6.1 Determine colorfastness to water in accordance with AATCC 107-1975.

7.6.2 This method is a "Guideline" procedure to evaluate color change within the cleaned area under standardized conditions.

Although not directly related to consumer cleansing with water-base or solvent-base cleansing agents, it will give reliable information on the fastness of the fabric coloration to water and solvent, which are the principal agents that would cause color migration, bleeding, or any combination thereof. In this context, the color change occurring in these tests denotes any change due to color loss or bleeding and migration of one color to another within the cleaned area.

7.6.3 In the evaluation of the test results, the fabric tested is compared against the original to establish color change.

7.6.4 Those fabrics that are not fast to water or solvent media or both, and show a color change should be so labeled.

7.7 *Colorfastness to Solvent:*

7.7.1 Determine the colorfastness to solvent in accordance with AATCC 107-1975, with the following modifications:

7.7.2 *Test Solution* — Use technical grade perchloroethylene.

NOTE 7 — Perchloroethylene is toxic, and the usual precautions for handling chlorinated solvents should be taken. It should be used only under well ventilated conditions. The solvent is nonflammable.

NOTE 8 — The rollers in the wringer used should be such that they will not be affected by the solvent.

7.7.3 After loading the specimens in the Perspiration Tester, Perspirometer, or similar device, allow them to stand for 2 h in the prevailing room atmosphere. Then remove them from the unit and allow them to dry completely while hanging in the prevailing room atmosphere. Do not press or iron the specimens.

7.7.4 See 7.6.2 to 7.6.4.

7.8 *Colorfastness to Burnt Gas Fumes* — Determine the colorfastness to burnt gas fumes in accordance with AATCC 23-1975. Do not wash or dryclean these fabric specimens either before or after testing.

7.9 *Colorfastness to Crocking* — Determine the colorfastness to wet and dry crocking in accordance with AATCC 8-1974 for solid shades and AATCC 116-1974 for prints, or as agreed between the purchaser and selle.

7.10 *Colorfastness to Light* — Determine the colorfastness to light in accordance with AATCC 16A-1974 or 16E-1976.

NOTE 9 — There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc[8] (not sunshine-carbon-arc). Consequently, these two fading lamps cannot be used interchangeably since there is no known overall correlation between them. In case of controversy, AATCC Method 16E-1976 shall prevail.

7.11 *Colorfastness to Ozone* — Determine the colorfastness to ozone in accordance with AATCC 129-1975.

7.12 *Retention of Hand, Character, and Appearance* — A fabric tested in accordance with 7.5, 7.6, and 7.7 shall not change more in hand, character, or appearance than in the limitations set by prior agreement between purchaser and seller.

NOTE 10 — Water tests would not apply, if labeled "Solvent Clean Only."

7.13 *Durability of Back Coating* — A fabric shall exhibit no cracking or peeling of back coating when tested in accordance with 7.5, 7.6, and 7.7. Durability should be compatible with cleaning code.

7.14 *Flammability* — The flammability requirements shall be as agreed between purchaser and seller, except when regulated by applicable Government mandatory standards.

7.15 *FTC Requirements* — The Federal Trade Commission (FTC) promulgated the Guides for the Household Furniture Industry.[9] Although the Textile Fiber Products Identification Act specifically exempts outer coverings of furniture from the application of the act, the FTC has very specific regulations covered in detail in Guide 5 of the Guides for the Household Furniture Industry. In brief, this rule covers the following:

7.15.1 False or deceptive representation as to fiber content,

7.15.2 How to identify fibers properly in advertising,

7.15.3 How to identify fibers properly on tags or labels,

7.15.4 Restrictions concerning representation of fabric tests, and

7.15.5 Restrictions concerning representation of performance characteristics of upholstery fabrics.

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[8] The Carbon-Arc and Xenon Fade-Ometers available from the Atlas Electric Devices Co. 4114 N Ravenswood Ave., Chicago, Ill. 60613, have been found satisfactory for this method.

[9] Promulgated by the FTC on Dec. 21, 1973, to be effective on March 21, 1974.

TABLE 1 Specification Requirements

Characteristics	Requirements	Section
Breaking strength (load)	50 lbf (222 N), min	7.1
Tongue tear strength	6 lbf (27 N), min	7.2
Resistance to yarn slippage	25 lbf (111 N), min	7.3
Surface abrasion[A]		
Light-duty	3000 cycles (double rubs), min	7.4
Medium-duty	9000 cycles (double rubs), min	7.4
Heavy-duty	15,000 cycles (double rubs), min	7.4
Dimensional change:		
Warp or filling	5.0% shrinkage, max to 2.0% gain, max	7.5
Colorfastness to:[B]		
Water,[C] Color Change	class 4,[D] min	7.6
Solvent,[C] Color Change	class 4,[D] min	7.7
Burnt gas fumes-2 cycles	class 4,[D] min	7.8
Crocking:		
Dry	class 4,[E] min	7.9
Wet	class 3,[E] min	7.9
Light-40 AATCC Fading Units	class 4,[D] min	7.10
Ozone 1 cycle	class 4,[D] min	7.11
Retention of hand, character, and appearance	pass	7.12
Durability of back coating	pass	7.13
Flammability	pass	7.14
FTC Requirements	pass	7.15

[A] For guideline purposes—See Note 4.

[B] Class in the colorfastness requirements is based on a numerical scale of 5 for negligible for no colorchange or color transfer to 1 for very severe color change or color transfer.

[C] For guidelines purposes—See Section 7.6.2.

[D] AATCC Gray Scale for Color Change.

[E] AATCC Chromatic Transference Scale.

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Designation: D 3600 – 81$^{\epsilon 1}$

Standard Performance Specification for
MEN'S AND BOYS' WOVEN RAINWEAR AND ALL-PURPOSE, WATER-REPELLENT COAT FABRICS[1]

This standard is issued under the fixed designation D 3600; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

$^{\epsilon 1}$NOTE— Editorial corrections were made throughout in June 1982.

1. Scope

1.1 This performance specification covers men's and boys' woven rainwear and all-purpose water-repellent coat fabrics composed of any fiber or mixture of textile fibers.

1.2 This performance specification is not applicable to woven fabrics used for interlinings.

1.3 These requirements apply to the length and width directions for those properties where each fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards:*

D 123 Definitions of Terms Relating to Textiles[2]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[3]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[3]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[3]

D 1905 Test for Dimensional Changes in Laundering of Woven or Knitted Fabrics[4]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant Rate-of-Traverse Tensile Testing Machine)[3]

D 2724 Testing Bonded and Laminated Apparel Fabrics[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

2.2 *AATCC Methods:*[5]

8-1974 Colorfastness to Crocking: AATCC Crockmeter Method

15-1976 Colorfastness to Perspiration

16A-1974 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E-1976 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous light

22-1974 Water Repellency: Spray Test

23-1975 Colorfastness to Burnt Gas Fumes

35-1974 Water Resistance: Rain Test

61-1975 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

107-1975 Colorfastness to Water

116-1974 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

119-1974 Color Change due to Flat Abrasion (Frosting): Screen Wire Method

124-1975 Appearance of Durable Press Fabrics after Repeated Home Launderings

132-1976 Colorfastness to Drycleaning

135-1973 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics

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[1] This specification is under the jurisdiction of ASTM committee D-13 on Textiles, and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

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[2] *Annual Book of ASTM Standards,* Parts 32 and 33.

[3] *Annual Book of ASTM Standards,* Part 32.

[4] Discontinued, see *1977 Annual Book of ASTM Standards,* Part 32.

[5] AATCC Technical Manual, available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

Evaluation Procedure 1 Gray Scale for Color Change
Evaluation Procedure 2 Gray Scale for Staining
Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the test methods that prevail in this document are referenced in Section 7 on Test Methods.

3. Definitions

3 1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, woven fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: This fabric meets ASTM Specification D 3600 except for the following characteristic(s).

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer. Any "partially cured" or "post cured" fabrics should first be processed in accordance with the fabric manufacturer's instructions.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for men's and boys' woven rainwear and all-purpose, water-repellent coats shall conform to the specification requirements in Table 1.

7. Test Methods (Note 1)

7.1 *Breaking Strength* (*Load*)—Determine the dry breaking strength, in the standard atmosphere for testing textiles, as directed in the grab test procedure of Method D 1682-64 (1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± 0.5 in. (305 ± 13 mm)/min.

NOTE 2—If preferred, the use of a constant-rate of-extension (CRE) tensile testing machine is permitted. The crosshead speed should be agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and with the CRE machine. Consequently, these two breaking loads can not be used interchangeably. In case of controversy, the CRT method shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434–75.

7.3 *Tongue Tear Strength*—Determine the tear strength as directed in Method D 2262-71.

NOTE 3—If preferred, use of Method D 1424-63 (1975) is permitted with existing requirements as given in this standard. There may be no overall correlation between the results obtained with the tongue tear machine and with the Elmendorf machine. Consequently, these two tongue tear testers can not be used interchangeably. In case of controversy, Method D 2262-71 shall prevail.

7.4 *Dimensional Change:*

7.4.1 *Pressing and Finishing During Garment Manufacturing*—Mark specimen(s) as directed in Section 4.3.1 of AATCC Method 135-1973. Press and finish specimen(s) as agreed by the purchaser and the seller with respect to time cycles, temperature, steam, vacuum and mechanical pressure of the presshead. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135-1973 (see 3.2.1.).

7.4.2 *Laundering*—Determine the maximum dimensional change after 5 launderings as directed in the applicable procedure in AATCC Method 135-1973 or as agreed between the purchaser and seller.

NOTE 4—Launderable fabrics are expected to be drycleanable except where all or part of the fabric is not drycleanable and is so labeled. For example, the fabric could contain a functional finish soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly (vinyl chloride) fiber. "Drycleanable" goods are to be drycleaned only.

NOTE 5—Specimens prepared for 7.4.1 may be used for 7.4.2 and 7.4.3 as desired. When this is done, the dimensional change due to laundering or drycleaning is calculated using Eq 1:

$$\% \text{ dimensional change} = [(D_1 - D_2)/D_2] \times 100$$

where:

D_1 = measurement after laundering or drycleaning, and

D_2 = measurement after pressing and curing.

7.4.2.1 The wash conditions and drying procedure shall be as specified by the seller.

7.4.3 *Drycleaning*—Determine the maximum dimensional change after three drycleanings as directed in Section 10.1.1 through 10.1.4 of Method D 2724-72 or as agreed upon between the purchaser and seller (Notes 4 and 5).

7.5 *Colorfastness:*

7.5.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23-1975.

NOTE 6—Washing conditions shall be the same as those used in 7.4.2.1. Drycleaning conditions shall be the same as those used in 7.4.3.

7.5.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1975. The test conditions shall be as specified by the seller (Note 4).

7.5.3 *Colorfastness to Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132-1976 (Note 4).

7.5.4 *Colorfastness to Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1974 for solid shades and AATCC Method 116-1974 for prints or as agreed between the purchaser and the seller.

7.5.5 *Colorfastness to Water*—Determine colorfastness to water as directed in AATCC Method 107-1975.

7.5.6 *Colorfastness to Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1976 (acid phase).

7.5.7 *Colorfastness to Light*—Determine colorfastness to light as directed in AATCC Method 16A-1974 or AATCC Method 16E-1976.

NOTE 7—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine carbon-arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1976 shall prevail.

7.5.8 *Color Change Due to Flat Abrasion (Frosting)*—Determine the color change due to flat abrasion (frosting) as directed in AATCC Method 119–1974.

7.6 *Water Resistance (Rain Test)*—Determine the water resistance (rain test) on the original fabric and after three launderings as in 7.4.2.1 or three drycleanings as in 7.4.3 as directed in AATCC Method 35-1974.

7.6.1 Fabrics shall be classified by conformance to the requirements given for the categories in Table 1.

7.7 *Resistance to Wetting (Spray Test)*—Determine the resistance to wetting (spray test) on the original fabric and after three launderings as in 7.4.2.1 or three drycleanings as in 7.4.3 as directed in AATCC Method 22-1974.

7.7.1 Determine the resistance to wetting of laundered or drycleaned fabrics after pressing as specified by the seller.

7.8 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124-1978 after laundering as specified in Section 7.4.2.1 for washable fabrics or as specified in Section 7.4.3 for drycleanable fabrics (see Note 4).

7.8.1 For fabrics not intended for use in

"Durable Press" garments, determine the fabric smoothness after pressing as specified in Section 12.1.4 of Method D 1905-73.

7.9 *Flammability*—The flammability requirements shall be as agreed between purchaser and seller, except when regulated by applicable Government mandatory standards.

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

TABLE 1 **Specification Requirements**

NOTE—More than one standard method can be used to measure these properties. These methods cannot be used interchangeably since there can be no overall correlation between them (see Notes 2, 3, and 7).

Characteristic	Requirements	Section
Breaking strength (load) (CRT Method)	40 lbf (178 N), min	7.1
Yarn slippage	25 lbf (111 N), min	7.2
Tear strength (Tongue Tear Method)	3 lbf (13 N), min	7.3
Dimensional Change		
Pressing and curing	2 % max, in each direction	7.4.1
After 5 launderings	3 % max, in each direction	7.4.2
After 3 drycleanings	2 % max, in each direction	7.4.3
Colorfastness:		
Burnt gas fumes—2 cycles		7.5.1
Shade change, original fabric	Class 4^A min	
Shade change after 1 laundering or 1 drycleaning	Class 4^A min	
Laundering		7.5.2
Shade change	Class 4^A min	
Staining	Class 3^B min	
Drycleaning		7.5.3
Shade change	Class 4^A min	
Crocking		7.5.4
Dry	Class 4^C min	
Wet	Class 3^C min	
Water		7.5.5
Shade change	Class 4^A min	
Staining	Class 4^B min	
Perspiration (acid phase)		7.5.6
Shade change	Class 4^A min	
Staining	Class 4^B min	
Light (40 AATCC FU) (xenon-arc)^D	Class 4^A min	7.5.7
Frosting	Class 4^A min	7.5.8
Water Resistance		
Categories based on minimum time for 1-g weight increase at head pressures of:		7.6
2 ft (600 mm)	30 s, shower	
2 ft (600 mm)	2 min, rain	
3 ft (915 mm)	5 min, storm	
Water repellence		
Smooth-textured fabrics		7.7
Original	90 min	
After 3 launderings or 3 drycleanings	70 min	
Rough-textured		
Original	80 min	
After 3 launderings or 3 drycleanings	70 min	
Fabric appearance	D.P. 3.5, min	7.8
Flammability	pass	7.9

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] Class in the colorfastness requirements is based on a numerical scale of 5 for negligible color change or color transfer to 1 for very severe color change or color transfer.

Designation: D 3655 – 81$^{\epsilon 1}$

Standard Performance Specification for
MEN'S AND WOMENS' SLIVER KNITTED OVERCOAT AND JACKET FABRICS[1]

This standard is issued under the fixed designation D 3655; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

$^{\epsilon 1}$Editorial changes were made throughout in June 1982.

1. Scope

1.1 This performance specification covers men's and womens' sliver knitted overcoat and jacket fabrics composed of any textile fiber or mixture of textile fibers.

1.2 This performance specification is not applicable to knitted fabrics used for interlinings.

1.3 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards:*

D 123 Definitions of Terms Relating to Textiles[2]

D 231 Testing and Tolerances for Knit Goods[3]

D 2724 Testing Bonded and Laminated Apparel Fabrics[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[4]

2.2 *AATCC Methods:*[5]

8-1974 Colorfastness to Crocking: AATCC Crockmeter Method

15-1976 Colorfastness to Perspiration

16A-1974 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E-1976 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

61-1975 Colorfastness to Washing, Domestic, and Laundering, Commercial Accelerated

107-1975 Colorfastness to Water

116-1974 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

132-1976 Colorfastness to Drycleaning

135-1973 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics

Evaluation Procedure 1 Gray Scale for Color Change

Evaluation Procedure 2 Gray Scale for Staining

Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM test methods that prevail are referenced in Section 7.

3. Definitions

3.1 *fabric, silver-knitted, n.*—a single-jersey fabric in which untwisted staple fibers are knitted in at each loop to form a pile surface on the technical back of the jersey structure.

3.2 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Fabric Performance Requirements.

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[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] Discontinued, see *1979 Annual Book of ASTM Standards*, Part 32.

[4] *Annual Book of ASTM Standards*, Part 32.

[5] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

purchaser and the seller, woven fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: This fabric meets ASTM Specification D 3655 except for the following characteristic(s).

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.1.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for men's and womens' sliver knitted overcoats and jackets shall conform to the specification requirements in Table 1.

7. Test Methods (See Note 1)

7.1 *Bursting Strength*—Determine the bursting strength, in the standard atmosphere for testing textiles, as directed in Method D 231 – 62 (1975) using an approved type of constant-rate-of-traverse machine equipped with a bursting attachment or an approved type of diaphragm tester as agreed between the purchaser and the seller.

NOTE 2—There is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphragm bursting tester. Consequently, these two bursting testers cannot be used interchangeably. In case of controversy, the CRT machine equipped with a bursting attachment method shall prevail.

NOTE 3—The precision of the ball bursting method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm bursting method are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the material to be evaluated.

7.2 *Dimensional Change:*

7.2.1 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135-1973 or as agreed upon between the purchaser and the seller (Note 3).

7.2.1.1 The wash conditions and drying procedure shall be as specified by the seller.

7.2.2 *Drycleaning*—Determine the maximum dimensional change after three drycleanings in accordance with Section 10.1.1 through 10.1.4 of Method D 2724 – 72 or as agreed upon between the purchaser and the seller.

NOTE 4—Launderable fabrics are expected to be drycleanable except where all or part of the fabric is not drycleanable and is so labeled. For example, the fabric could contain a functional finish soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. "Drycleanable" goods are to be drycleaned only.

7.3 *Colorfastness:*

7.3.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23-1975.

NOTE 5—Washing conditions shall be the same as those used in 7.2.1.1. Drycleaning conditions shall be the same as those used in 7.2.2.

7.3.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1975. The test conditions shall be as specified by the seller (Note 3).

7.3.3 *Colorfastness to Drycleaning*—Determine the colorfastness to drycleaning as directed in AATCC Method 132-1976 (Note 3).

7.3.4 *Colorfastness to Crocking*—Determine the colorfastness to dry and wet crocking as directed in AATCC Method 8-1974 for solid shades and AATCC Method 116-1974 for prints or as agreed between the purchaser and the seller.

7.3.5 *Colorfastness to Water*—Determine the colorfastness to water as directed in AATCC Method 107-1975.

7.3.6 *Colorfastness to Perspiration*—Determine the colorfastness to perspiration as directed in AATCC Method 15-1976.

7.3.7 *Colorfastness to Light*—Determine the colorfastness to light as directed in AATCC Method 16A-1974 or AATCC Method 16E-1976.

NOTE 6—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon-arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1976 shall prevail.

7.4 *Flammability*—The flammability requirements shall be as agreed between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 Specification Requirements

NOTE—The classes of colorfastness in the AATCC methods referenced in this table are based on a numerical scale of 5 for negligible or no color change or color transfer to 1 for very severe color change or color transfer.

Characteristic	Requirements	Section
Bursting strength (Ball Burst)[A]	70 lbf (311 N) min	7.1
Dimensional Change:		
After 5 launderings	3 % max, in each direction	7.1
After 3 drycleanings	2 % max, in each direction	7.2
Colorfastness:		
Burnt gas fumes, 2 cycles:		7.3.1
Shade change original fabric	Class 4[B] min	
Shade change after 1 laundering or 1 drycleaning	Class 4[B] min	
Laundering:		7.3.2
Shade change	Class 4[B] min	
Staining	Class 3[C] min	
Drycleaning:		7.3.3
Shade change	Class 4[B] min	
Crocking:		7.3:4
Dry	Class 4[D] min	
Wet	Class 3[D] min	
Water:		7.3.5
Shade change	Class 4[B] min	
Staining	Class 4[C] min	
Perspiration (acid phase)		7.3.6
Shade change	Class 4[B] min	
Staining	Class 3[C] min	
Light (40 AATCC FU) (xenon arc)[A]	Step 4[B] min	7.3.7
Flammability	pass	7.4

[A] More than one method can be used to measure these properties. These methods can not be used interchangeably since there can be no overall correlation between them (see Notes 2, 3, and 6).

[B] AATCC Gray Scale for Color Change.

[C] AATCC Gray Scale for Staining.

[D] AATCC Chromatic Transference Scale.

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Designation: D 3690 - 78

An American National Standard

Standard Performance Specification for
VINYL-COATED AND URETHANE-COATED UPHOLSTERY FABRICS – INDOOR[1]

This standard is issued under the fixed designation D 3690; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers performance requirements for vinyl-coated and urethane-coated upholstery fabrics produced with woven, knit, or nonwoven substrates which are used in the manufacture of new indoor furniture.

1.2 This specification is not applicable to fabrics used in porch, deck, or lawn furniture; nor for plain knit fabrics and plain, tufted or flocked, woven upholstery fabrics.

1.3 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards:*

D 123 Definitions of Terms Relating to Textiles[2]

D 751 Testing Coated Fabrics[3]

D 1175 Test for Abrasion Resistance of Textile Fabrics[4]

D 1203 Test for Loss of Plasticizer from Plastics (Activated Carbon Methods)[5]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[6]

D 2097 Flex Testing of Finish on Upholstery Leather[7]

D 2136 Testing Coated Fabrics—Low-Temperature Bend Test[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[6]

2.2 *AATCC Methods:*[8]

8-1974 Colorfastness to Crocking: AATCC Crockmeter Method

16A-1974 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E-1974 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

116-1974 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

Gray Scale for Color Change, Evaluation Procedure 1

Chromatic Transference Scale, Evaluation Procedure 3

2.3 *Chemical Fabrics and Film Association Standards:*[9]

CFFA-5 Test for Blocking

CFFA-20 Test for Tearing Strength, Procedure B—Tongue Method

NOTE 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7 on Test Methods.

3. Definitions

3.1 *hydrolytic stability, n*—the ability to withstand the environmental effects of high humidity.

3.2 *blocking, n*—the measurement of the development of surface tack and the thermal softening point of the material.

3.3 *tack tear, n*—the measurement of the resistance of a coated fabric to tearing under conditions simulating an installation that has been tacked in place.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D 13.56 on Performance Standards for Textile Fabrics.

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[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 38.

[4] Discontinued, see *1981 Annual Book of ASTM Standards*, Part 32.

[5] *Annual Book of ASTM Standards*, Part 35.

[6] *Annual Book of ASTM Standards*, Part 32.

[7] *Annual Book of ASTM Standards*, Part 21.

[8] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

[9] Available from Chemical Fabrics and Film Association, 1230 Keith Bldg., Cleveland, Ohio 44115

3.3.1 Tack tear is intended primarily for testing vinyl-coated fabrics for furniture or automotive applications.

3.4 For definitions of other textile terms used in this specification, refer to Definitions D 123 and to the Yearbook of the American Association of Textile Chemists and Colorists.[7]

4. Uses and Significance

4.1 This specification covers the performance requirements for vinyl-coated and urethane-coated upholstery fabrics used in the manufacture of indoor furniture that will be subjected to normal, nonabusive consumer usage. There are three class designations for breaking strength, tear strength, and tack-tear resistance to identify the varying degrees of durability or performance. These classifications are: Class A – heavy duty; Class B – medium duty; and Class C – light duty.

4.2 It is recognized that for purposes of fashion or aesthetics, the ultimate consumer of articles made from these fabrics may find acceptable some fabrics that do not conform to all of the requirements in Table 1. For example, the fabric could be dyed in shades that do not meet the requirement in Table 1 for colorfastness to light, yet be acceptable to the ultimate consumer because the shade is fashionable. In such cases, one or more of the requirements may be modified by mutual agreement between the purchaser and the seller.

4.2.1 If any of the requirements in Table 1 are modified by mutual agreement between the purchaser and the seller, any reference to the specification shall specify that: "This fabric meets ASTM Specification D 3690 except for the following characteristic(s)."

4.3 The uses and significance of particular properties are discussed in the appropriate sections of the specific methods.

5. Performance Requirements

5.1 The properties of vinyl-coated or urethane-coated upholstery fabrics shall conform to the specification requirements of one of the three categories in Table 1.

6. Sampling

6.1 Tests shall be performed on the fabric as it will reach the consumer.

6.2 Select the lot samples as specified in the applicable test methods. In the absence of such instructions in a specific test method, select the lot sample as agreed between the purchaser and the seller.

6.3 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test method.

6.3.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the true average (that is, a theoretical average from an infinite number of observations) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

7. Test Methods (see Note 1)

7.1 *Breaking Strength (Load)* – Determine the breaking strength (load) as directed in the grab test of Method D 1682 - 64 (1975) using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± 1/2 in. (305 ± 13 mm)/min.

Note 2 – If preferred, the use of a constant-rate-of-extension (CRE) tensile testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and with the CRE machine. Consequently, these two breaking load testers cannot be used interchangeably. In case of controversy, the CRT method shall prevail.

7.2 *Tongue Tear Strength* – Determine tongue tear strength as directed in Procedure B of CFFA Method 20 using a constant-rate-of-traverse (CRT) tensile testing machine (see Note 2).

7.3 *Tack-Tear Resistance* – Determine the tack-tear resistance as directed in Sections 43 to 47 of Method D 751 - 73.

7.4 *Adhesion of Coating to Substrate:*

7.4.1 Determine the adhesion of coating to substrate as directed in Sections 39 to 42 of Method D 751 - 73, with the speed of the pulling clamp at 12 ± 1/2 in. (305 ± 13 mm)/min.

7.4.2 Report adhesion in pounds-force per inch (newtons per metre) of width.

7.5 *Surface Abrasion:*

7.5.1 Determine the surface abrasion as directed in Sections 33 to 42 of Method D 1175 - 71, using the Rotary Platform, Double-Head Method with a CS-17 wheel and 500-g load.

7.5.2 After 200 cycles, the test specimens are rated visually for color change.

7.6 *Resistance to Flexing* — Determine the resistance to flexing as directed in Method D 2097 - 69 (1974) with the specimens mounted face side out.

7.7 *Blocking at Elevated Temperature* — Determine the blocking at elevated temperature as directed in CFFA Method 5.

7.8 *Resistance to Cracking at Low Temperature* — Determine the resistance to cracking at low temperature as directed in Method D 2136 - 66 (1972) with the cold chamber temperature at −10 ± 1°F (−23 ± 1°C).

7.9 *Colorfastness:*

7.9.1 *Crocking* — Determine the colorfastness to wet and dry crocking as directed in AATCC Method 8-1974 for solid shades and AATCC Method 116-1974 for prints, or as agreed between the purchaser and the seller.

7.9.2 *Light* — Determine the colorfastness to light as directed in AATCC Method 16A-1974 or 16E-1976.

NOTE 3 — There is distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine carbon-arc). Consequently, these two fading lamps cannot be used interchangeably since there is no known correlation between them. In case of controversy, AATCC Method 16E-1976 shall prevail.

NOTE 4 — Standardization of the xenon-arc lamp to 120 AATCC Fu can be done by using three L5 Blue Wool Lightfastness Standards.

7.10 *Loss of Plasticizer from Plastics (Activated Carbon Method)* — Determine the loss of plasticizer as directed in Method A of Method D 1203 - 67 (1974).

NOTE 5 — The loss of plasticizer test only applies to vinyl-coated fabrics.

7.11 *Hydrolytic Stability* — The following tests cover accelerated determinations of changes that might occur when coated fabrics are subjected to a combination of specific conditions of elevated temperature and high humidity. These tests are intended to detect changes that may occur in the coating which would reduce the surface abrasion resistance, change the adhesion of the coating to the substrate, or alter the resistance of the coating to cracking or delamination due to flexing in relation to end-use performance.

NOTE 6 — Moisture alone can also cause hydrolytic degradation in the coating of these fabrics.

7.11.1 *Apparatus:*

7.11.1.1 *Laboratory Chamber*, capable of maintaining the required test temperature within ±2°F (±1°C) and maintaining the relative humidity of the test within ±5 %.

7.11.1.2 *Constant-Rate-of-Traverse (CRT) Tensile Testing Machine*, with the speed of the pulling jaw at 12 ± $^1/_2$ in. (305 ± 13 mm)/min. as described in Method D 751 - 73.

7.11.1.3 *Oscillatory Cylinder Abrasion Tester*, as described in Method D 1175 - 71.

7.11.1.4 *Newark Flex Tester*, as described in Method D 2097 - 69(1974).

7.11.2 *Test Specimens* — The sample to be exposed to high temperatures and humidity shall be a panel large enough to provide the specimens required for the following tests;

7.11.2.1 *Adhesion* — Four specimens, 2 in. (51 mm) wide by 8 in. (203 mm) long shall be cut, two of which shall have the longer dimensions parallel to the lengthwise direction of the fabric; and the other two specimens shall be cut with the long dimension parallel to the widthwise direction of the fabric. Adhesion shall be reported as the value per inch of width.

7.11.2.2 *Surface Abrasion* — Three specimens in the fabric length direction, each measuring 1$^7/_8$ in. (48 mm) wide by 9 in. (229 mm) long with the long dimension cut parallel to the fabric length direction.

7.11.2.3 *Resistance to Flexing* — Prepare two specimens measuring 3 by 4.5 in. (76 by 114 mm); one in the lengthwise direction and the other in the crosswise direction.

7.11.3 *Procedure* — Expose the large sample of coated fabric, from which test specimens will be taken, in the humidity chamber at 158 ± 2°F (70 ± 1°C) and 95 ± 5 % relative humidity for 15 days. Following this exposure, condition the sample for 24 h at 70 ± 2°F (21 ± 1.1°C) and 65 ± 2 % relative humidity. After conditioning for 2 h, cut the specimens for adhesion, surface abrasion, and flex testing in accordance with the sizes given in 7.11.2.

7.11.3.1 *Adhesion*—Determine the adhesion as directed in Sections 39 to 42 of Method D 751 - 73 with the speed of the pulling clamp at 12 ± $^1/_2$ in. (305 ± 13 mm)/min.

7.11.3.2 *Surface Abrasion*—Determine the surface abrasion as directed in Sections 26 to 29 of Method D 1175 - 71 (Oscillatory Cylinder Method), with the following modifications:

NOTE 7—The Oscillatory Cylinder Method of Method D 1175 - 71 is specified due to the historical usage of this method by furniture manufacturers; and one by which they have accumulated much data which, reportedly, has correlated with end-use performance in certain cases. Nonetheless, Section 5 of Method D 1175 - 71 states that the procedure is not recommended for acceptance testing. Consequently, the test requirements for this performance factor should be used with caution, with the knowledge that different fabrics will not always be ranked by this test in the same order as by actual abrasive wear which takes place on specific pieces of furniture.

(*a*) The abradent to be used is a desized and bleach 100 } cotton sateen fabric,[10] 53 in. (135 cm) wide with a thread count of 96 by 60 and having a yield of 1.12 yd/lb (2.3 m/kg). Expose the face side of the fabric to the coated fabric being abraded.

(*b*) The tension on the specimen shall be 4 lbf (18 N) and the compression force shall be 3 lbf (13 N).

(*c*) Give the specimen 25 000 double rubs (cycles).

7.11.3.3 *Resistance to Flexing*—Determine the resistance to flexing as directed in Method D 2097 - 69 (1974), with the specimens mounted face side out. Flex the specimen for 15 000 cycles and then remove from the machine for examination.

7.11.4 *Report of Hydrolytic Stability Parameters*—Report the vinyl-coated or urethane-coated specimens tested for hydrolytic stability with respect to adhesion, surface abrasion, and resistance to flexing as follows:

7.11.4.1 *Adhesion*—Average the values of adhesion for the two specimens tested in each direction. Calculate L, the percent loss, using Eq. 1:

$$L = 100\,(O - H)/O \qquad (1)$$

where:

O = adhesion of original fabric, and
H = adhesion after hydrolytic stability treatment.

7.11.4.2 *Surface Abrasion* — Report whether or not the skin coat has "breaks" or other surface changes.

7.11.4.3 *Resistance to Flexing*—Report whether or not the coating shows evidence of cracking or delamination from the base fabric.

7.11.5 *Precision and Accuracy:*

7.11.5.1 *Precision*—The precision of the procedures in hydrolytic stability for testing adhesion, surface abrasion, and flex abrasion have not been established.

7.11.5.2 *Accuracy*—No justifiable statements can be made about the accuracy of the procedures in hydrolytic stability for testing adhesion, surface abrasion, and resistance to flexing since the true values of the properties cannot be determined by accepted referee methods.

7.12 *Flammability*—The flammability requirements shall be as agreed between the purchaser and the seller, except when regulated by applicable government mandatory standards.

NOTE 8—The technical need for an ASTM test method for determining the flammability of the types of fabrics addressed by this specification has been referred to Subcommittee D13.52 on Flammability and will be incorporated here should a test method become available.

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[10] Available from Testfabrics Inc., P.O. Box 118, Middlesex, N.J. 08846.

TABLE 1 Performance Requirements

Property	Requirements			Section
	Class A	Class B	Class C	
Breaking strength (load) (CRT Method):[D]				7.1
Length	55 lbf (244 N) min	50 lbf (222 N) min	45 lbf (200 N) min	
Width	55 lbf (244 N) min	50 lbf (222 N) min	40 lbf (178 N) min	
Tongue tear strength (CRT Method)[D]				7.2
Length	6 lbf (27 N) min	4 lbf (18 N) min	3 lbf (13 N) min	
Width	5 lbf (22 N) min	3 lbf (13 N) min	2 lbf (9 N) min	
Tack-tear resistance:				7.3
Length	30 lbf (133 N) min	25 lbf (111 N) min	15 lbf (67 N) min	
Width	30 lbf (133 N) min	20 lbf (89 N) min	15 lbf (67 N) min	
Adhesion of coating to substrate	3.0 lbf/in. (525 N/m) min	3.0 lbf/in. (525 N/m) min	3.0 lbf/in. (525 N/m) min	7.4
Surface abrasion	no appreciable color change at 200 cycles, Class A, B, and C			7.5
Resistance to flexing	no cracking or delamination at 15 000 cycles, Class A, B, and C			7.6
Blocking at elevated temperature	rating 2, min, no blocking; coating adheres slightly, Class A, B, and C			7.7
Resistance to cracking at low temperature	no cracking at −10 ± 1°F (−23 ± 1°C), Class A, B, and C			7.8
Colorfastness to crocking:[A]				7.9.1
Dry	class 4.0 min[B]	class 4.0 min[B]	class 4.0 min[B]	
Wet	class 4.0 min[B]	class 4.0 min[B]	class 4.0 min[B]	
Colorfastness to light (Xenon)[D] (120 AATCC Fading Units)	Step 4 min[C]	Step 4 min[C]	Step 4 min[C]	7.9.2
Loss of plasticizer	10 % max	10 % max	10 % max	7.10
Hydrolytic stability:				7.11
Adhesion	must maintain 75 % of original strength, Class A, B, and C			7.11.3.1
Surface abrasion	no cracking or delamination at 25 000 cycles, Class A, B, and C			7.11.3.2
Resistance to flexing	no breaks in coating at 15 000 cycles, Class A, B, and C			7.11.3.3
Flammability	pass	pass	pass	7.12

[A] Class in b and c is based on a numerical scale of 5 for negligible color transfer or color change to 1 for very severe color transfer or color change. The numerical rating in Table 1 or higher is acceptable.

[B] AATCC Chromatic Transference Scale.

[C] AATCC Gray Scale for Color Change.

[D] There is more than one standard method that can be used to measure breaking strength, tongue tear strength, and lightfastness. These methods cannot be used interchangeably since there may be no overall correlation between them (see Notes 2 and 3).

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

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Designation: D 3691 - 78

An American National Standard

Standard Performance Specification for
WOVEN, LACE, AND KNIT HOUSEHOLD CURTAIN AND DRAPERY FABRICS[1]

This standard is issued under the fixed designation D 3691; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers the requirements for all knit, lace, foam back, stitch-bonded, conventional weights, and sheer woven fabrics to be used in the manufacture of curtains and draperies.

1.2 This performance specification is not applicable to fabrics made of glass.

1.3 For those properties where fabric direction is pertinent, these requirements apply to the length and width directions for woven fabric and to both the wale and course directions for knit fabric.

2. Applicable Documents

2.1 *ASTM Standards:*

D 123 Definitions of Terms Relating to Textiles[2]

D 231 Testing and Tolerances for Knit Goods[3]

D 1336 Test for Distortion of Yarn in Woven Fabrics[4]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling Pendulum (Elemendorf) Apparatus[4]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[4]

D 2262 Test for Testing Strength of Woven Fabrics by The Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[4]

D 2724 Testing Bonded and Laminated Apparel Fabrics[4]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[4]

2.2 *AATCC Methods*[5]

8-1974 Colorfastness to Crocking: AATCC Crockmeter Method

16A-1974 Colorfastness to Light: Carbon-Arc Continuous Light

16E-1976 Colorfastness to Light: Water Cooled Xenon-Arc Lamp Continuous Light

23-1975 Colorfastness to Burnt Gas Fumes

61-1975 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

116-1974 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124-1975 Appearance of Durable Press Fabric after Repeated Home Laundering

129-1975 Colorfastness to Ozone in the Atmosphere under High Humidities

132-1976 Colorfastness to Dry Cleaning

135-1973 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabric

Evaluation Procedure 1 Gray Scale for Color Change

Evaluation Procedure 2 Gray Scale for Staining

Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated edition of ASTM test methods that prevail in this document are referenced in Section 7 on Test Methods.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved Sept. 21, 1978. Published December 1978.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] Discontinued, see *1979 Annual Book of ASTM Standards*, Part 32.

[4] *Annual Book of ASTM Standards*, Part 32.

[5] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

3. Definitions

3.1 *sheer, n* – a woven fabric that is transparently thin or diaphanous, such as chiffon, batiste, net, organdy, and voile.

3.2 For definitions of other textile terms used in this specification, refer to Definitions D 123 and to the Yearbook of the American Association of Textile Chemists and Colorists.[4]

4. Uses and Significance

4.1 Woven lace and knit fabrics should meet all of the requirements in Table 1 to be suitable for use in the manufacture of curtains and draperies.

4.2 It is recognized that for purposes of fashion or aesthetics, the ultimate consumer of articles made from these fabrics may find acceptable some fabrics that do not conform to all of the requirements in Table 1. For example, the fabric could be dyed in shades that do not meet the requirement in Table 1 for colorfastness to light, yet be acceptable to the ultimate consumer because the shade is fashionable. In such cases, one or more of the requirements may be modified by mutual agreement between the purchaser and the seller.

4.2.1 If any of the requirements in Table 1 are modified by mutual agreement between the purchaser and the seller, any reference to the specification shall specify that: "This fabric meets ASTM Specification D 3691 except for the following characteristic(s)."

4.3 The uses and significance of particular properties are discussed in the appropriate sections of the specific methods.

5. Performance Requirements

5.1 The properties of woven, lace and knit fabrics for curtains and draperies shall conform to the specification requirement in Table 1.

6. Sampling

6.1 Tests shall be performed on the fabric as it will reach the user.

6.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens specified in each of the applicable test methods.

6.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is not more than 5 % of the average above or below the true average (that is, a theoretical average from an infinite number of observations) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

7. Test Methods (Note 1)

7.1 *Breaking Strength* (load) woven fabrics only) – Determine the breaking strength, as directed in the grab test of Method D 1682 - 64(1975) using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± 0.5 in. (305 ± 13 mm)/min.

NOTE 2 – If preferred a constant-rate-of-extension (CRE) tensile testing machine may be used. The crosshead speed should be as agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and with the CRE machine. Consequently, these two breaking load testers cannot be used interchangeably. In case of controversy, the CRT method shall prevail.

7.2 *Bursting Strength* (knit fabrics only) – Determine the bursting strength of knit fabrics as directed in Method D 231 - 62(1975) using an approved type of constant-rate-of-traverse (CRT) machine equipped with a bursting attachment or an approved type of diaphragm bursting tester as agreed between the purchaser and the seller.

NOTE 3 – Care should be taken to subtract the tare diaphragm pressure from the gross pressure to obtain actual bursting strength of fabric when using the diaphragm bursting tester. Calibrate the equipment according to manufacturer's instruction before use. Since there is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphragm bursting tester, these two bursting testers cannot be used interchangeably. In case of controversy, the CRT machine equipped with a bursting attachment method shall prevail.

NOTE 4 – The precision of the ball burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm bursting tester method are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the type of material to be evaluated.

7.3 *Tongue Tear Strength* (woven fabrics only) – Determine the tear strength as directed in Method D 2262 – 71(1976).

Note 5 – If preferred, use of Method D 1424 – 63(1975) is permitted with existing requirements as given in this standard. There may be no overall correlation between the results obtained with the tongue tear machine and with the Elmendorf machine. Consequently, these two tongue tear testers cannot be used interchangeably. In case of controversy, Method D 2262 – 71 shall prevail.

7.4 *Dimensional Change:*

7.4.1 *Laundering* – Determine the dimensional change after five launderings as directed in Test II B of AATCC Method 135–1973 unless otherwise agreed between the purchaser and seller.

Note 6 – Launderable fabrics are expected normally to be drycleanable, except where all or part of the fabric is not drycleanable and is so labeled. For example, the fabric could contain a functional finish soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. "Drycleanable" goods are to be drycleaned only.

7.4.1.1 Mark the test specimens in sets of three 18-in. (460-mm) gage distance in both the length and width directions.

7.4.1.2 Proceed as outlined in AATCC Method 135-1973.

Note 7 – Nondurable press items can be flat bed pressed after tumble drying to eliminate wrinkles before measuring.

7.4.2 *Drycleaning* – Determine the dimensional change after three dry cleanings as directed in 10.1.1 to 10.1.4 of Method D 2724 – 72 (Note 6).

7.4.2.1 Mark test specimens in sets of three 18-in. (460-mm) gage distance in both the length and width directions.

7.4.2.2 Proceed as outlined in Section 10.1.1 to 10.1.4 of Method D 2724 – 72.

7.5 *Distortion of Yarn* (woven fabrics only) – Determine the distortion of yarn as directed in Method D 1336 – 72 using a 1-lbf (4.4-N) load for sheer fabrics and a 2-lbf (8.9-N) load for all other woven fabrics.

7.6 *Colorfastness:*

7.6.1 *Laundering* – Determine the colorfastness to laundering as directed in Test II A of AATCC Method 61-1975 unless otherwise agreed between the purchaser and seller (Note 6).

7.6.1.1 In this test, use Multifiber Test Fabric No. 10[5] and evaluate only cotton, polyester, and self fiber.

7.6.2 *Drycleaning* – Determine the colorfastness to drycleaning as directed in AATCC Method 132-1976 (Note 6).

7.6.3 *Burnt Gas Fumes* – Determine the colorfastness to burnt gas fumes after 2 cycles on the original fabric as directed in AATCC Method 23-1975. Repeat test for 2 cycles on another specimen after one laundering or one drycleaning.

Note 8 – Laundering conditions shall be the same as those in 7.4.1 and drycleaning conditions shall be the same as those in 7.4.2.

7.6.4 *Crocking* – Determine the colorfastness to wet and dry crocking as directed in AATCC Method 8-1974 for solid shades and AATCC Method 116-1974 for prints, or as agreed between the purchaser and seller.

7.6.5 *Light* – Determine colorfastness to light as directed in AATCC Method 16A-1974 or AATCC Method 16E-1976.

Note 9 – There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine carbon-arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no known overall correlation between them. In case of controversy, AATCC Method 16E-1976 shall prevail.

Note 10 – Standardization of the xenon-arc lamp to 60 AATCC FU can be done by using three L4 Blue Wool Lightfastness Standards.

7.6.6 *Ozone Fading* – Determine the colorfastness to ozone fading after one cycle as directed in AATCC Method 129–1975.

7.7 *Fabric Appearance* – Determine the appearance of durable press fabric after five launderings as directed in Test II B of AATCC Method 124-1975 unless otherwise agreed between the purchaser and seller.

7.8 *Retention of Hand, Character and Appearance* – Fabric tested in accordance to 7.4.1 and 7.4.2 shall not change more in hand, character, or appearance than in the limitation set by prior agreement between purchaser and seller.

7.9 *Durability of Back Coating* – A fabric shall exhibit no evidence of cracking or peeling of back coating when subjected to tests in accordance with 7.4.1 and 7.4.2.

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[5] Available from Testfabrics, Inc., P.O. Box 118, Middlesex, N.J. 08846.

7.10 *Flammability* — The flammability requirements shall be as agreed between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

NOTE 10 — The technical need for an ASTM test method for determining the flammability of the types of fabric addressed by this specification has been referred to Subcommittee D13.52 on Flammability and will be incorporated here should a test method become available.

7.11 *Resistance to Light Degradation* — No standard method is available for the determination of light degradaton of curtain and drapery fabrics.[6]

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[6] The development of a standard method has been referred to the American Association of Textile Chemists and Colorists.

TABLE 1 Performance Requirements

Characteristics	Knit and Lace	Sheer (woven)	Foam Back, Stitch Bonded, and Conventional Weights (woven)	Section
Breaking strength (load), (CRT method), in both directions[E]	. . .	15 lbf (67 N) min	20 lbf (89 N) min	7.1
Bursting strength (ball burst)[E]	20 lbf/in^2 (138 kPa) min	. . .	. . .	7.2
Tear strength (tongue tear), in both directions[E]	. . .	1 lbf (4.4 N) min	1.5 lbf (6.7 N) min	7.3
Dimensional change:				
After 5 launderings in both directions	3.0 % max	3.0 % max	3.0 % max	7.4.1
After 3 drycleanings in both directions	3.0 % max	3.0 % max	3.0 % max	7.4.2
Distortion of yarn:				
1-lbf load	. . .	0.1 in. (2.54 mm) max	. . .	7.5
2-lbf load	. . .	. . .	0.1 in. (2.54 mm) max	
Colorfastness to laundering:[A]				
Alteration in shade	Class 4[B] min	Class 4[B] min	Class 4[B] min	7.6.1
Staining	Class 3[C] min	Class 3[C] min	Class 3[C] min	
Colorfastness to drycleaning:				
Alteration in shade	Class 4[B] min	Class 4[B] min	Class 4[B] min	7.6.2
Burnt gas fumes, 2 cycles				
Alteration in shade	Class 4[B] min	Class 4[B] min	Class 4[B] min	7.6.3
After 1 refurbishing	Class 4[B] min	Class 4[B] min	Class 4[B] min	
Crocking				
Dry	Class 4[D] min	Class 4[D] min	Class 4[D] min	7.6.4
Wet	Class 3[D] min	Class 3[D] min	Class 3[D] min	
Light (60 AATCC FU), xexon[E]	Step 4[B] min	Step 4[B] min	Step 4[B] min	7.6.5
Ozone, 1 cycle	Class 4[B] min	Class 4[B] min	Class 4[B] min	7.6.6
Fabric appearance	DP 3.5[G] min	DP 3.0 min	DP 3.5 min	7.7
Retention of hand, character, and appearance	pass	pass	pass	7.8
Durability of back coating	pass	pass	pass	7.9
Flammability	pass	pass	pass	7.10
Light degradation[F]	. . .	. . .	. . .	7.11

[A] Class in Colorfastness and DP rating is based on a numerical scale of 5.0 for negligible color change, color transfer, or wrinkling to 1.0 for very severe color change, color transfer, or wrinkling. The numerical rating in Table 1 or higher is acceptable.

[B] AATCC Gray Scale for Color Change.

[C] AATCC Gray Scale for Staining.

[D] AATCC Chromatic Transference Scale.

[E] There is more than one standard method that can be used to measure breaking strength, bursting strength, tear strength, and lightfastness. These methods cannot be used interchangeably since there may be no overall correlation between them (see Notes 2, 3, 4, 5, and 9).

[F] The development of a standard method has been referred to the American Association of Textile Chemists and Colorists.

[G] For durable press fabrics only.

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Designation: D 3778 – 81$^{\epsilon1}$

Standard Performance Specification for
WOMEN'S AND GIRLS' DRYCLEANABLE WOVEN DRESS COAT FABRICS[1]

This standard is issued under the fixed designation D 3778; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

$^{\epsilon1}$ Note—Editorial changes were made throughout in June 1982.

1. Scope

1.1 This performance specification covers women's and girls' woven drycleanable dress coat outer fabrics composed of any textile fiber or mixture of textile fibers.

1.2 This performance specification is not applicable to woven fabrics used for linings and interlinings, rainwear garments, and all-purpose, water repellent garments, nor is this performance specification applicable to bonded or laminated fabrics.

1.3 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

1.4 When a fabric requires special treatment, specific methods will be described as they are developed for that material, and such special tests will have precedence over these general requirements.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2,3]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[2]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[2]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[2]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[2]

D 2724 Testing Bonded and Laminated Apparel Fabrics[2]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[2]

2.2 *AATCC Methods*:[4]

8-1974 Colorfastness to Crocking: AATCC Crockmeter Method

15-1976 Colorfastness to Perspiration

16A-1974 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E-1976 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23-1975 Colorfastness to Burnt Gas Fumes

96-1975 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool

116-1974 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124-1975 Appearance of Durable Press Fabrics After Repeated Home Launderings

132-1976 Colorfastness to Dry Cleaning

135-1973 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved Feb. 27, 1981. Published July 1981. Originally published as D 3778 – 79. Last previous edition D 3778 – 79.

[2] *Annual Book of ASTM Standards*, Part 32.

[3] *Annual Book of ASTM Standards*, Part 33.

[4] Available from the American Association of Textile Chemists and Colorists, P.O. Box 1225, Research Triangle Park, N.C. 27709.

Evaluation Procedure 1 Gray Scale for Color Change

Evaluation Procedure 2 Gray Scale for Staining

Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, woven fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: This fabric meets ASTM Specification D 3778 except for the following characteristic(s).

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer. Any "partially finished" or "post-finished" fabrics should first be processed in accordance with the fabric manufacturer's instructions.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for women's and girls' woven drycleanable dress coats shall conform to the specification requirements in Table 1.

7. Test Methods (See Note 1)

7.1 *Breaking Strength* (*Load*)—Determine the dry breaking strength (load) in the standard atmosphere for testing textiles, as directed in the grab test procedure of Method D 1682 – 64 (1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± 0.5 in. (305 ± 13 mm)/min.

NOTE 2—If preferred, the use of a constant-rate-of-extension (CRE) tensile testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and with the CRE machine. Consequently, these two breaking load testers cannot be used interchangeably. In case of controversy, the CRT method, ASTM Method D 1682 – 64 (1975), shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434 – 75.

NOTE 3—The precision of Method D 434 – 75 is being established and it may not be suitable for fabrics with low yarn counts (see 4.2) in terms of ends and picks per inch.

7.3 *Tongue Tear Strength*—Determine the tongue tear strength as directed in Method D 2262 – 71.

NOTE 4—If preferred, use of Method D 1424 – 63 (1975) is permitted with existing requirements as given in this standard. There may be no overall correlation between the results obtained with the tongue tear machine and with the Elemendorf machine. Consequently, these two tongue tear testers cannot be used interchangeably. In case of controversy, Method D 2262 - 71 shall prevail.

7.4 *Dimensional Change*:

7.4.1 *Pressing and Finishing During Garment Manufacturing*—Mark specimen(s) as directed in 4.3.1 of AATCC Method 135 - 1973. Press and finish specimen(s) as agreed by the purchaser and the seller with respect to time cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135 - 1973 (see Note 2).

7.4.2 *Drycleaning*—Press the specimen(s) as agreed by the purchaser and the seller prior to drycleaning. Determine the maximum dimensional change after three drycleanings as directed in Sections 10.1.1 through 10.1.6 of Method D 2724 - 72.

NOTE 5—Specimens prepared for 7.4.1 may be used for 7.4.2 as desired. When this is done, the dimensional change due to drycleaning is calculated using Eq 1. The dimensional change to pressing and finishing is determined on the fabrics as it will reach the user. It is not additive to the dimensional change to laundering or drycleaning of the fabric as it will reach the consumer (see Section 5.1).

$$\text{Percent Dimensional Change} = 100(D_1 - D_2)/D_2 \quad (1)$$

where

D_1 = measurement after laundering or drycleaning, and

D_2 = measurement after pressing and finishing.

7.5 *Colorfastness*:

7.5.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one drycleaning as directed in AATCC Method 23 - 1975.

NOTE 6—Drycleaning conditions shall be the same as those used in 7.4.2.

7.5.2 *Drycleaning*—Determine the colorfastness to drycleaning as directed in AATCC Method 132 - 1976 (see Note 6).

7.5.3 *Crocking*—Determine the colorfastness to dry and wet crocking as directed in AATCC Method 8 - 1974 for solid shades and AATCC Method 116 - 1974 for prints or as agreed between the purchaser and the seller.

7.5.4 *Perspiration*—Determine the colorfastness to perspiration as directed in AATCC Method 15 - 1976.

7.5.5 *Light*—Determine the colorfastness to light as directed in AATCC Method 16A - 1974 or AATCC Method 16E - 1976.

NOTE 7—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E - 1976 shall prevail.

7.6 *Fabric Appearance*—Determine the fabric appearance as directed in Section 7 of AATCC Method 124 - 1975 after drycleaning as specified in 7.4.2.

7.6.1 The fabric smoothness DP (durable press) rating shall have decreased no more than ½ DP rating from that of the fabric before it is drycleaned.

7.7 *Flammability*—The flammability requirements shall be as agreed between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 **Specification Requirements**

NOTE—Class in colorfastness and DP requirements is based on a numerical scale of 5 for negligible or no color change, color transfer, or fabric wrinkle to 1 for severe color change, color transfer, or fabric wrinkle.

Characteristic	Requirements	Section
Breaking strength (load) (CRT)	30 lbf (133 N) min	7.1
Napped fabrics:		
Length	25 lbf (111 N) min	
Width	20 lbf (89 N) min	
Yarn slippage		7.2
Cross-dyed fabrics	⅛ in. (3.2 mm) max separation at 20 lbf (89 N)	
Solid shades	¼ in. (6.3 mm) max separation at 20 lbf (89 N)	
Tongue tear strength	3 lbf (13 N), min	7.3
Dimensional Change:		
Pressing	2 % max shrinkage and 0 % growth	7.4.1
Drycleaning	2 % max shrinkage and 0 % growth	7.4.2
Colorfastness:		
Burnt gas fumes—2 cycles		7.5.1
Shade change, original fabric	Class 4^A min	
Shade change, after one drycleaning	Class 4^A min	
Drycleaning:		7.5.2
Shade change	Class 4^A min	
Crocking:		7.5.3
Dry	Class 4^B min	
Wet	Class 3^B min	
Perspiration:		7.5.4
Shade change	Class 4^A min	
Staining	Class 3^C min	
Light (20 AATCC FU) (xenon arc)	Step 4^A min	7.5.5
Fabric appearance (see 7.6.1)		7.6
Flammability	Pass	7.7

[A] AATCC Gray Scale for Color Change.

[B] AATCC Chromatic Transference Scale.

[C] AATCC Gray Scale for Staining.

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Designation: D 3779 – 81$^{\epsilon 1}$

Standard Performance Specification for
WOMEN'S AND GIRLS' WOVEN RAINWEAR AND ALL-PURPOSE, WATER-REPELLENT COAT FABRICS[1]

This standard is issued under the fixed designation D 3779; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

$^{\epsilon 1}$ Note—Editorial changes were made throughout in June 1982.

1. Scope

1.1 This performance specification covers women's and girls' woven rainwear and all-purpose water-repellent coat outer fabrics composed of any textile fiber or mixture of textile fibers.

1.2 This performance specification is not applicable to woven fabrics used for linings and interlinings, nor is this performance specification applicable to bonded or laminated fabrics.

1.3 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2, 3]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[2]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[2]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[2]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[2]

D 2724 Testing Bonded and Laminated Apparel Fabrics[2]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[2]

2.2 *AATCC Methods*:[4]

8-1974 Colorfastness to Crocking: AATCC Crockmeter Method

15-1976 Colorfastness to Perspiration

16A-1974 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E-1976 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

22-1974 Water Repellency: Spray Test

23-1975 Colorfastness to Burnt Gas Fumes

35-1974 Water Resistance: Rain Test

61-1975 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

96-1975 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool

107-1975 Colorfastness to Water

116-1974 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

119-1974 Color Change Due to Flat Abrasion (Frosting): Screen Wire Method

124-1975 Appearance of Durable Press Fabrics after Repeated Home Launderings

132-1976 Colorfastness to Dry Cleaning

135-1973 Dimensional Changes in Automatic Home Laundering of Durable Press

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

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[2] *Annual Book of ASTM Standards*, Part 32.

[3] *Annual Book of ASTM Standards*, Part 33.

[4] Available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

Woven or Knit Fabrics
Evaluation Procedure 1 Gray Scale for Color Change
Evaluation Procedure 2 Gray Scale for Staining
Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specified dated editions of the ASTM test methods that prevail in this document are referenced in Section 7.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, woven fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: This fabric meets ASTM Specification D 3779 except for the following characteristic(s).

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer. Any "partially cured" or "post-cured" fabrics should first be processed in accordance with the fabric manufacturer's instructions.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for women's and girls' woven rainwear and all-purpose, water-repellent coats shall conform to the specification requirements in Table 1.

7. Test Method (See Note 1)

7.1 *Breaking Strength* (*Load*)—Determine the dry breaking strength in the standard atmosphere for testing textiles, as directed in the grab test procedure of Method D 1682 – 64 (1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± 0.5 in. (305 ± 13 mm)/min.

NOTE 2—If preferred, the use of a constant-rate-of-extension (CRE) tensile testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and with the CRE machine. Consequently, these two breaking load testers cannot be used interchangeably. In case of controversy, the CRT method, ASTM Method D 1682 – 64 (1975), shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434 – 75.

NOTE 3—The precision of Method D 434 – 75 is being established, and it may not be suitable for fabrics with low yarn counts (see 4.2) in terms of ends and picks per inch.

7.3 *Tongue Tear Strength*—Determine the tongue tear strength as directed in Method

D 2262 – 71.

NOTE 4—If preferred, use of Method D 1424 – 63 (1975) is permitted with existing requirements as given in this standard. There may be no overall correlation between the results obtained with the tongue tear machine and with the Elmendorf machine. Consequently, these two tongue tear testers cannot be used interchangeably. In case of controversy, Method D 2262 – 71 shall prevail.

7.4 *Dimensional Change*:

7.4.1 *Pressing and Finishing During Garment Manufacturing*—Mark specimen(s) as directed in Section 4.3.1 of AATCC Method 135 – 1973. Press and finish specimen(s) as agreed by the purchaser and the seller with respect to time, cycles, temperature, steam, vacuum, and mechanical pressure of the presshead. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135 – 1973 (see Note 2).

7.4.2 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135 – 1973 (see Notes 6 and 7).

7.4.2.1 The wash conditions and drying procedure shall be as specified by the seller.

7.4.3 *Drycleaning*—Determine the maximum dimensional change after three drycleanings in accordance with Sections 10.1 through 10.1.4 of Method D 2724 – 72.

NOTE 5—Launderable fabrics are expected to be drycleanable except where all or part of the fabric is not drycleanable and is so labeled. For example, the fabric could contain a functional finish soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. "Drycleanable" goods are to be drycleaned only.

NOTE 6—Specimens prepared for 7.4.1 may be used for 7.4.2 and 7.4.3, as desired. When this is done, the dimensional change due to laundering or drycleaning is calculated using Eq 1. The dimensional change to pressing and finishing is determined on the fabrics as it will reach the user. It is not additive to the dimensional change to laundering or drycleaning of the fabric as it will reach the consumer (see 5.1).

$$\text{Percent Dimensional Change} = 100(D_1 - D_2)/D_2 \quad (1)$$

where

D_1 = measurement after laundering or drycleaning, and

D_2 = measurement after pressing and finishing.

7.5 *Colorfastness*:

7.5.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23 – 1975.

NOTE 7—Washing conditions shall be the same as those used in 7.4.2.1. Drycleaning conditions shall be the same as those used in 7.4.3.

7.5.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61 – 1975. The test conditions shall be as specified by the seller (see Note 5).

7.5.3 *Colorfastness to Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132 – 1976 (see Note 5).

7.5.4 *Colorfastness to Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8 – 1974 for solid shades and AATCC Method 166 – 1974 for prints or as agreed between the purchaser and the seller.

7.5.5 *Colorfastness to Water*—Determine colorfastness to water as directed in AATCC Method 107 – 1975.

7.5.6 *Colorfastness to Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15 – 1976.

7.5.7 *Colorfastness to Light*—Determine colorfastness to light as directed in AATCC Method 16A – 1974 or AATCC Method 16E – 1976.

NOTE 8—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E – 1976 shall prevail.

7.5.8 *Color Change Due to Flat Abrasion (Frosting)*—Determine the color change due to flat abrasion (frosting) as directed in AATCC Method 199 – 1974.

7.6 *Water Resistance (Rain Test)*—Determine the water resistance (rain test) on the original fabric and after three launderings as in 7.4.2.1 or three drycleanings as in 7.4.3 as directed in AATCC Method 35 – 1974.

7.6.1 Fabrics shall be classified by conformance to the requirements given for the categories in Table 1.

7.7 *Water Repellency (Spray Test)*—Determine the resistance to water repellence (spray test) on the original fabric and after five launderings as in 7.4.2.1 or three drycleanings as in

7.4.3 as directed in AATCC Method 22 – 1974.

7.7.1 Determine the resistance to wetting of laundered or drycleaned fabrics after pressing as specified by the seller.

7.8 *Fabric Appearance*—Determine the fabric appearance as directed in Section 7 of AATCC Method 124 – 1975 after laundering using the wash-and-wear cycle or the normal cycle as agreed between the purchaser and the seller as specified in 7.4.2.1 for washable fabrics or after drycleaning as specified in 7.4.3 for drycleanable fabrics (see Note 6).

7.8.1 For fabrics not intended for use in "durable press" garments, determine the fabric smoothness after pressing as specified in Section 5.12 of AATCC Method 96 – 1975.

7.8.1.1 The fabric smoothness DP (durable press) rating of such fabrics shall have decreased no more than ½ DP rating from that of the fabric before it is drycleaned or laundered.

7.9 *Flammability*—The flammability requirements shall be as agreed between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 Specification Requirements

NOTE—Class in colorfastness and DP requirements is based on a numerical scale of 5 for negligible or no color change, color transfer, or fabric wrinkle to 1 for severe color change, color transfer, or fabric wrinkle.

Characteristic	Requirements	Section
Breaking strength (load) (CRT)	40 lbf (178 N), min	7.1
Yarn slippage	¼-in. (6.3-mm) separation at 25 lbf (111 N), min	7.2
Tongue tear strength	3 lbf (13 N), min	7.3
Dimensional change:		
Pressing and finishing	2 % max	7.4.1
After five launderings	3 % max	7.4.2
After three drycleanings	2 % max	7.4.3
Colorfastness		
Burnt gas fumes—2 cycles		
Shade change, original fabric	Class 4[A], min	7.5.1
Shade change after one laundering or one dry cleaning	Class 4[A], min	
Laundering:		7.5.2
Shade change	Class 4[A], min	
Staining	Class 3[B], min	
Drycleaning (shade change)	Class 4[A], min	7.5.3
Crocking:		7.5.4
Dry	Class 4[C], min	
Wet	Class 3[C], min	
Water:		7.5.5
Shade change	Class 4[A], min	
Staining	Class 4[B], min	
Perspiration:		7.5.6
Shade change	Class 4[A], min	
Staining	Class 3[B], min	
Light (20 AATCC FU)	Step 4[A], min	7.5.7
Frosting	Class 4[A], min	7.5.8
Water resistance (categories based on minimum time for 1-g weight increase at following head pressures):		
2 ft (600 mm)	30 s (shower)	7.6
2 ft (600 mm)	2 minutes (rain)	
3 ft (915 mm)	5 minutes (storm)	
Water repellence:		
Smooth-textured fabrics:		
Original	90, min	7.7
After five launderings or three drycleanings	70, min	
Rough-textured:		
Original	80, min	7.8
After five launderings or three drycleanings	70, min	
Fabric appearance (see 7.8.1.1)	DP 3.5 min[D]	7.8
Flammability	pass	7.9

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] For durable press fabrics only.

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Designation: D 3780 – 79

An American National Standard

Standard Performance Specification for
MEN'S AND BOYS' WOVEN DRESS SUIT FABRICS AND WOVEN SPORTSWEAR JACKET, SLACK, AND TROUSER FABRICS[1]

This standard is issued under the fixed designation D 3780; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers men's and boys' woven dress suit fabrics and woven sportswear jacket, slack, and trouser fabrics composed of any textile fiber or mixture of textile fibers.

1.2 This performance specification is not applicable to woven fabrics used for interlinings.

1.3 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2, 3]
D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[2]
D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[2]
D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[2]
D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant Rate-of-Traverse Tensile Testing Machine)[2]
D 2724 Testing Bonded and Laminated Apparel Fabrics[2]
D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[2]

2.2 *AATCC Methods:*[4]

8-1974 Colorfastness to Crocking: AATCC Crockmeter Method
15-1976 Colorfastness to Perspiration
16A-1974 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light
16E-1976 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light
23-1975 Colorfastness to Burnt Gas Fumes
61-1975 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated
96-1975 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool
116-1974 Colorfastness to Crocking: Rotary Vertical Crockmeter Method
119-1974 Color Change Due to Flat Abrasion (Frosting): Screen Wire Method
124-1975 Appearance of Durable Press Fabrics after Repeated Home Launderings
132-1976 Colorfastness to Drycleaning
135-1973 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics
Evaluation Procedure 1 Gray Scale for Color Change
Evaluation Procedure 2 Gray Scale for Staining

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

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[2] *Annual Book of ASTM Standards*, Part 32.

[3] *Annual Book of ASTM Standards*, Part 33.

[4] Available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7.

3. Terminology

3.1 *Definitions*:

3.1.1 *dimensional change, n—in pressing and finishing of textiles*, the change in dimensions of a fabric caused by pressing and finishing during garment manufacture.

3.1.2 For definitions of other textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Definitions D 123.

3.2 *Description of Term*:

3.2.1 *pressing and finishing*—this term takes into account all of the industrial pressing and finishing treatments used in garment production.

NOTE 2—No standard method is available for reproducing on a laboratory level the results of industrial press or finish treatments, or both, used in the manufacture of woven outerwear garments.[5]

4. Uses and Significance

4.1 Woven fabrics should meet all of the requirements in Table 1 to be suitable for use in the manufacture of suits, jackets, slacks, and trousers for men and boys.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable some fabrics that do not conform to all of the requirements in Table 1. For example, the fabric could be dyed in shades that do not meet the requirements in Table 1 for colorfastness to light, yet be acceptable to the ultimate consumer because the shade is fashionable. In such cases, one or more of the requirements may be modified by mutual agreement between the purchaser and the seller.

4.2.1 If any of the requirements in Table 1 are modified by mutual agreement between the purchaser and the seller, any reference to the specification shall specify that "this fabric meets ASTM Specification D 3780 except for the following characteristic(s)."

4.3 The uses and significance of particular properties are discussed in the appropriate sections of the specific methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer. Any "partially cured" or "post-cured" fabrics should first be processed in accordance with the fabric manufacturer's instructions.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for men's and boys' woven dress suits and woven sportswear jackets, slacks, and trousers shall conform to the specifications requirements in Table 1.

7. Test Method (See Note 1)

7.1 *Breaking Strength (Load)*—Determine the dry breaking strength, in the standard atmosphere for testing textiles, in accordance with the grab test procedure of Method D 1682-64 (1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± 0.5 in. (305 ± 13 mm)/min.

NOTE 3—If preferred, the use of a constant-rate-of-extension (CRE) tensile testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and with the CRE machine. Consequently, these two breaking load testers cannot be used interchangeably. In case of controversy, the CRT method shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434-75.

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[5] The development of a standard method has been referred to Subcommittee D13.59 on Fabric Test Methods, General.

NOTE 4—The precision of Method D 434-75 is being established, and it may not be suitable for fabrics with low yarn counts (see 4.2).

7.3 *Tongue Tear Strength*—Determine the tongue tear strength as directed in Method D 2262-71.

NOTE 5—If preferred, use of Method D 1424-63 (1975) is permitted with existing requirements as given in this standard. There may be no overall correlation between the results obtained with the tongue tear machine and with the Elmendorf machine. Consequently, these two tongue tear testers cannot be used interchangeably. In case of controversy, Method D 2262-71 shall prevail.

7.4 *Dimensional Change*:

7.4.1 *Pressing and Finishing During Manufacturing*—Mark specimen(s) as directed in Section 4.3.1 of AATCC Method 135-1973. Press and finish specimen(s) as agreed upon by the purchaser and the seller with respect to time cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135-1973 (see Note 2).

7.4.1.1 If no agreement has been made between the purchaser and the seller, press the specimen(s) using a flat-bed steam press according to the cycle in Sections 10.1.3.1 through 10.1.3.5 of Method D 2724-72.

7.4.2 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135-1973 (Notes 6 and 7).

7.4.2.1 The wash conditions and drying procedure shall be as specified by the seller.

7.4.3 *Drycleaning*—Determine the maximum dimensional change after three drycleanings in accordance with Sections 10.1.1 through 10.1.4 of Method D 2724-72.

NOTE 6—Launderable fabrics are expected to be drycleanable except where all or part of the fabric is not drycleanable and is so labeled. For example, the fabric could contain a functional finish soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. "Drycleanable" goods are to be drycleaned only.

NOTE 7—Specimens prepared for 7.4.1 may be used for 7.4.2 and 7.4.3 as desired. When this is done, subtract the pressing and finishing dimensional change from the total dimensional change to obtain that portion due to laundering or drycleaning. The dimensional change to pressing and finishing is determined on the fabric as it will reach the user. It is not additive to the dimensional change to laundering or drycleaning of the fabric as it will reach the consumer (see 5.1).

7.5 *Colorfastness*:

7.5.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23-1975.

NOTE 8—Washing conditions shall be the same as those used in 7.4.2.1. Drycleaning conditions shall be the same as those used in 7.4.3.

7.5.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1975. The test conditions shall be as specified by the seller (Note 6).

7.5.3 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132-1976 (Note 6).

7.5.4 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1974 for solid shades and AATCC Method 116-1974 for prints or as agreed between the purchaser and the seller.

7.5.5 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1976.

7.5.6 *Light*—Determine colorfastness to light as directed in AATCC Method 16A-1974 or AATCC Method 16E-1976.

NOTE 9—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1976 shall prevail.

7.5.7 *Flat Abrasion (Frosting)*—Determine the color change due to flat abrasion (frosting) as directed in AATCC Method 119-1974.

7.6 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124-1975 after laundering using the wash-and-wear cycle or the normal cycle as agreed between the purchaser and the seller as specified in 7.4.2.1 for washable fabrics or after drycleaning as specified in 7.4.3 for drycleanable fabrics (see Note 6).

7.6.1 For fabrics not intended for use in "durable press" garments, determine the fabric smoothness after pressing as specified in Section 5.12 of AATCC Method 96-1975.

7.6.1.1 The fabric smoothness DP (durable press) rating of such fabrics, and the DP rating of drycleaned fabrics, shall have decreased no more than ½ DP rating from that of the fabric before it is laundered or drycleaned.

7.7 *Flammability*—The flammability requirements shall be as agreed between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 **Specification Requirements**

NOTE—Class in a, b, c, and DP rating is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for severe color change, color transfer, or wrinkle. The numerical rating in Table 1 or a higher numerical rating is acceptable.

Characteristic	Requirements		Section
	Suit, Slack, Trouser	Jacket	
Breaking strength (load) (CRT):			7.1
Worsted count yarns	40 lbf (178 N), min	30 lbf (133 N), min	
Cotton count yarns	40 lbf (178 N), min	30 lbf (133 N), min	
Woolen run yarns	30 lbf (133 N), min	25 lbf (111 N), min	
Yarn slippage	¼-in. (6.3-mm) separation at 25 lbf (111 N), min	20 lbf (89 N), min	7.2
Tongue tear strength	2.5 lbf (11 N), min	2 lbf (9 N)	7.3
Dimensional Change:			
pressing and finishing (in each direction)	2 % max	2 % max	7.4.1
After five launderings (in each direction)	3 % max	3 % max	7.4.2
After three drycleanings (in each direction)	2 % max	2 % max	7.4.3
Colorfastness:			
Burnt gas fumes—2 cycles			
Shade change, original fabric	Class 4[A] min	Class 4[A] min	7.5.1
Shade change after one laundering or one drycleaning	Class 4[A] min	Class 4[A]min	
Laundering:			
Shade change	Class 4[A] min	Class 4[A] min	7.5.2
Staining	Class 3[B] min	Class 3[B] min	
Drycleaning:			
Shade change	Class 4[A] min	Class 4[A] min	7.5.3
Crocking:			
Dry	Class 4[C] min	Class 4[C] min	7.5.4
Wet	Class 3[C] min	Class 3[C] min	
Perspiration:			
Shade change	Class 4[A] min	Class 4[A] min	7.5.5
Staining	Class 3[B] min	Class 3[B] min	
Light (40 AATCC FU) (xenon-arc)	Step 4[A] min	Step 4[A] min	7.5.6
Frosting	Class 4[A] min	Class 4[A] min	7.5.7
Fabric appearance (See 7.6.1.1)	DP 3.5[D] min	DP 3.5[D] min	7.6
Flammability	pass	pass	7.7

[A] AATCC Gray Scale for Color Change.
[B] AATCC Gray Scale for Staining
[C] AATCC Chromatic Transference Scale.
[D] For durable press fabrics only.

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Designation: D 3781 - 79

An American National Standard

Standard Performance Specification for
MEN'S AND BOYS' KNITTED RAINWEAR AND ALL-PURPOSE, WATER-REPELLENT COAT FABRICS[1]

This standard is issued under the fixed designation D 3781; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers men's and boys' knitted rainwear and all-purpose water-repellent coat fabrics composed of any textile fiber or mixture of textile fibers.

1.2 This performance specification is not applicable to knitted fabrics used for interlinings.

1.3 These requirements apply to the length and width directions for those properties where each fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2, 3]
D 231 Testing and Tolerances for Knit Goods[4]
D 2594 Tests for Stretch Properties of Knitted Fabrics Having Low-Power[2]
D 2724 Testing Bonded and Laminated Apparel Fabrics[2]
D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[2]

2.2 *AATCC Methods:*[5]

8-1974 Colorfastness to Crocking: AATCC Crockmeter Method
15-1976 Colorfastness to Perspiration
16A-1974 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light
16E-1976 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light
22-1974 Water Repellency: Spray Test
23-1975 Colorfastness to Burnt Gas Fumes
35-1974 Water Resistance: Rain Test
61-1975 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated
96-1975 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool
116-1974 Colorfastness to Crocking: Rotary Vertical Crockmeter Method
124-1975 Appearance of Durable Press Fabrics after Repeated Home Launderings
132-1976 Colorfastness to Drycleaning
135-1973 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics
Evaluation Procedure 1 Gray Scale for Color Change
Evaluation Procedure 2 Gray Scale for Staining
Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7.

3. Terminology

3.1 *Definitions*:

3.1.1 *dimensional change, n—in pressing and finishing of textiles*, the change in dimensions of a fabric caused by pressing and finishing during garment manufacture.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

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[2] *Annual Book of ASTM Standards*, Part 32.

[3] *Annual Book of ASTM Standards*, Part 33.

[4] Discontinued, see *1979 Annual Book of ASTM Standards*, Part 32.

[5] Available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

3.1.2 For definitions of other textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Definitions D 123.

3.2 *Description of Term*:

3.2.1 *pressing and finishing*—this term takes into account all of the industrial pressing and finishing treatments used in garment production.

NOTE 2—No standard method is available for reproducing on a laboratory level the results of industrial press or finishing treatments, or both, used in the manufacture of woven outerwear garments.[5]

4. Uses and Significance

4.1 Knitted fabrics should meet all of the requirements in Table 1 to be suitable for use in the manufacture of rainwear and all-purpose, water-repellent coats for men and boys.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable some fabrics that do not conform to all of the requirements in Table 1. For example, the fabric could be dyed in shades that do not meet the requirement in Table 1 for colorfastness to light, yet be acceptable to the ultimate consumer because the shade is fashionable. In such cases, one or more of the requirements may be modified by mutual agreement between the purchaser and the seller.

4.2.1 If any of the requirements in Table 1 are modified by mutual agreement between the purchaser and the seller, any reference to the specification shall specify that "this fabric meets ASTM Specification D 3781 except for the following characteristic(s)."

4.3 The uses and significance of particular properties are discussed in the appropriate sections of the specific methods.

5. Sampling

5.1 Tests shall be performed on the fabrics as it will reach the consumer. Any "partially cured" or "post cured" fabrics should first be processed in accordance with the fabric manufacturer's instructions.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for men's and boys' knitted rainwear and all-purpose, water-repellent coats shall conform to the specification requirements in Table 1.

7. Test Method (See Note 1)

7.1 *Bursting Strength*—Determine the bursting strength, in the standard atmosphere for testing textiles, as directed in Method D 231-62 (1975) using an approved type of constant-rate-of-traverse machine equipped with a bursting attachment or an approved type of diaphragm bursting tester as agreed between the purchaser and the seller.

NOTE 3—There is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphragm bursting tester. Consequently, these two bursting testers cannot be used interchangeably. In case of controversy, the CRT machine equipped with a bursting attachment method shall prevail.

NOTE 4—The precision of the ball burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm bursting tester method are being established by Subcommittee D13.59 on Fabric Test Methods, General. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the material to be evaluated.

7.2 *Dimensional Change*:

7.2.1 *Pressing and Finishing During Manufacturing*—Mark Specimen(s) as directed in Section 4.3.1 of AATCC Method 135-1973. Press and finish specimen(s) as agreed by the purchaser and the seller with respect to time cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135-1973 (see Note 2).

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[5] The development of a standard method has been referred to Subcommittee D13.59 on Fabric Test Methods, General.

7.2.1.1 If no agreement has been made between the purchaser and the seller, press the specimen(s) using a flat-bed steam press according to the cycle in 10.1.3.1 through 10.1.3.5 of Method D 2724-72.

7.2.2 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135-1973 (Notes 5 and 6).

7.2.2.1 The wash conditions and drying procedure shall be as specified by the seller.

7.2.3 *Drycleaning*—Determine the maximum dimensional change after three drycleanings in accordance with Section 10.1.1 through 10.1.4 of Method D 2724-72 (Notes 5 and 6).

7.2.4 *Growth*—Determine the growth of the fabric as directed in Method D 2594-72.

NOTE 5—Launderable fabrics are expected to be drycleanable except where all or part of the fabric is not drycleanable and is so labeled. For example, the fabric could contain a functional finish soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. "Drycleanable" goods are to be drycleaned only.

NOTE 6—Specimens prepared for 7.2.1 may be used for 7.2.2 and 7.2.3 as desired. When this is done, subtract the pressing and finishing dimensional change from the total dimensional change to obtain that portion due to laundering or drycleaning. The dimensional change to pressing and finishing is determined on the fabric as it will reach the user. It is not additive to the dimensional change to laundering or drycleaning of the fabric as it will reach the consumer (see 5.1).

7.3 *Colorfastness*:

7.3.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23-1975.

NOTE 7—Washing conditions shall be the same as those used in 7.2.2.1. Drycleaning conditions shall be the same as those used in 7.2.3.

7.3.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1975. The test conditions shall be as specified by the seller (Note 5).

7.3.3 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132-1976 (Note 5).

7.3.4 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1974 for solid shades and AATCC Method 116-1974 for prints or as agreed between the purchaser and the seller.

7.3.5 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1976.

7.3.6 *Light*—Determine colorfastness to light as directed in AATCC Method 16A-1974 or AATCC Method 16E-1976.

NOTE 8—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1976 shall prevail.

7.4 *Water Resistance (Rain Test)*—Determine the water resistance (rain test) on the original fabric and after five launderings as in 7.2.2.1 or three drycleanings as in 7.2.3 as directed in AATCC Method 35-1974.

7.4.1 Fabrics shall be classified by conformance to the requirements given for the categories in Table 1.

NOTE 9—It is usual practice in manufacturing of rainwear and all-purpose, water-repellent garments to back knitted fabrics with a back coating or a lining. If garments made from knitted rainwear and all-purpose, water-repellent fabrics are to be lined, the test specimen may comprise (*a*) a single layer of the test fabric, or (*b*) a combination of the test fabric as the outer fabric and the lining fabric as the inner fabric as agreed between the purchaser and the seller.

7.5 *Water Repellency (Spray Test)*—Determine the resistance to wetting (spray test) on the original fabric and after five launderings as in 7.2.2.1 or three drycleanings as in 7.2.3 as directed in AATCC Method 22-1974.

7.5.1 Determine the resistance to wetting of laundered or drycleaned fabrics after pressing as specified by the seller.

7.6 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124-1975 after laundering using the wash-and-wear cycle or the normal cycle as agreed between the purchaser and the seller as specified in 7.2.2.1 for washable fabrics or as specified in 7.2.3 for drycleanable fabrics (see Note 5).

7.6.1 For fabrics not intended for use in "durable press" garments, determine the fabric smoothness after pressing as specified in Section 5.12 of AATCC Method 96-1975.

7.6.1.1 The fabric smoothness DP (durable press) rating of such fabrics, and the DP rating of drycleaned fabrics, shall have decreased no more than ½ DP rating from that of the fabric before it is laundered or drycleaned.

7.7 *Flammability*—The flammability requirements shall be as agreed between purchaser and seller, except when regulated by applicable Government mandatory standards.

TABLE 1 Specification Requirements

Note—Class in a, b, c and DP is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for very severe color change, color transfer, or wrinkle. The numerical rating in Table 1 or a higher numerical rating is acceptable.

Characteristic	Requirements	Section
Bursting strength (load) (ball burst)	50 lbf (222 N) min	7.1
Dimensional change:		
Pressing and finishing	2 % max, in each direction	7.2.1
After five launderings	3 % max, in each direction	7.2.2
After three drycleanings	2 % max, in each direction	7.2.3
Growth	3 % max, in each direction	7.2.4
Colorfastness:		
Burnt gas fumes—2 cycles:		7.3.1
Shade change, original fabric	Class 4[A] min	
Shade change after one laundering or one drycleaning	Class 4[A] min	
Laundering:		7.3.2
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Drycleaning:		7.3.3
Shade change	Class 4[A] min	
Crocking:		7.3.4
Dry	Class 4[C] min	
Wet	Class 3[C] min	
Perspiration (acid phase):		7.3.5
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Light (40 AATCC FU) (xenon-arc)	Step 4[A] min	7.3.6
Water resistance (categories based on minimum time for 1 g weight increase at following head pressures):		7.4
2 ft (600 mm)	30 s (shower)	
2 ft (600 mm)	2 minutes (rain)	
3 ft (915 mm)	5 minutes (storm)	
Water repellency:		7.5
Smooth-textured fabrics:		
Original	90, min	
After five launderings or three drycleanings	70, min	
Rough-textured:		
Original	80, min	
After five launderings or three drycleanings	70, min	
Fabric appearance (see 7.6.1.1)	DP 3.5[D], min.	7.6
Flammability	pass	7.7

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] For durable press fabrics only.

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Standard Performance Specification for

MEN'S AND BOYS' KNITTED DRESS SUIT FABRICS AND KNITTED SPORTSWEAR JACKET, SLACK, AND TROUSER FABRICS[1]

This standard is issued under the fixed designation D 3782; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers men's and boys' knitted dress suit and knitted sportswear jacket, slack, and trouser fabrics composed of any textile fiber or mixture of textile fibers.

1.2 This performance specification is not applicable to knitted fabrics used for interlinings.

1.3 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2, 3]
D 231 Testing and Tolerances for Knit Goods[4]
D 2594 Tests for Stretch Properties of Knitted Fabrics Having Low Power[2]
D 2724 Testing Bonded and Laminated Apparel Fabrics[2]
D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[2]

2.2 *AATCC Methods*:[5]

8-1974 Colorfastness to Crocking: AATCC Crockmeter Method
15-1976 Colorfastness to Perspiration
16A-1974 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light
16E-1976 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light
23-1975 Colorfastness to Burnt Gas Fumes
61-1975 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated
96-1975 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool
116-1974 Colorfastness to Crocking: Rotary Vertical Crockmeter Method
124-1975 Appearance of Durable Press Fabrics after Repeated Home Launderings
132-1976 Colorfastness to Drycleaning
135-1973 Dimensional Changes in Automatic Home Launderings of Durable Press Woven of Knit Fabrics
Evaluation Procedure 1 Gray Scale for Color Change
Evaluation Procedure 2 Gray Scale for Staining
Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7.

3. Terminology

3.1 *Definitions*:

3.1.1 *dimensional change, n—in pressing and finishing of textiles*, the change in dimensions of a fabric caused by pressing and finishing

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

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[2] *Annual Book of ASTM Standards*, Part 32.

[3] *Annual Book of ASTM Standards*, Part 33.

[4] Discontinued, see *1979 Annual Book of ASTM Standards*, Part 32.

[5] Available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

during garment manufacture.

3.1.2 For definitions of other textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Definitions D 123.

3.2 *Description of Term*:

3.2.1 *pressing and finishing*—this term takes into account all of the industrial pressing and finishing treatments used in garment production.

NOTE 2—No standard method is available for reproducing on a laboratory level the results of industrial press or finish treatments, or both, used in the manufacture of woven outerwear garments.[5]

4. Uses and Significance

4.1 Knitted fabrics should meet all of the requirements in Table 1 to be suitable for use in the manufacture of dress suits and sportswear jackets, slacks, and trousers for men and boys.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable some fabrics that do not conform to all of the requirements in Table 1. For example, the fabric could be dyed in shades that do not meet the requirement in Table 1 for colorfastness to light, yet be acceptable to the ultimate consumer because the shade is fashionable. In such cases, one or more of the requirements may be modified by mutual agreement between the purchaser and the seller.

4.2.1 If any of the requirements in Table 1 are modified by mutual agreement between the purchaser and the seller, any reference to the specification shall specify that "this fabric meets ASTM Specification D 3782 except for the following characteristic(s)."

4.3 The uses and significance of particular properties are discussed in the appropriate sections of the specific methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer. Any "partially finished" or "post-finished" fabrics should first be processed in accordance with the fabric manufacturer's instructions.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for men's and boys' knitted dress suits and sportswear jackets, slacks, and trousers shall conform to the specification requirements in Table 1.

7. Test Methods (See Note 1)

7.1 *Bursting Strength*—Determine the bursting strength, in the standard atmosphere for testing textiles, as directed in Method D 231-62(1975) using an approved type of constant-rate-of-traverse machine equipped with a bursting attachment or an approved type of diaphragm bursting tester as agreed between the purchaser and the seller.

NOTE 3—There is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphragm bursting tester. Consequently, these two bursting testers cannot be used interchangeably. In case of controversy, the CRT machine equipped with a bursting attachment method shall prevail.

NOTE 4—The precision of the ball burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm bursting tester method are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the material to be evaluated.

7.2 *Dimensional Change*:

7.2.1 *Pressing and Finishing During Manufacturing*—Mark specimen(s) as directed in Section 4.3.1 of AATCC Method 135-1973. Press and finish specimen(s) as agreed upon by the purchaser and the seller with respect to time cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135-1973 (see Note 2).

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[5] The development of a standard method has been referred to Subcommittee D13.59 on Fabric Test Methods, General.

7.2.1.1 If no agreement has been made between the purchaser and the seller, press the specimen(s) using a flat-bed steam press according to the cycle in 10.1.3.1 through 10.1.3.5 of Method D 2724-72.

7.2.2 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135-1973 (Notes 5 and 6).

7.2.2.1 The wash conditions and drying procedure shall be as specified by the seller.

7.2.3 *Drycleaning*—Determine the maximum dimensional change after three drycleanings in accordance with Section 10.1.1 through 10.1.4 of Method D 2724-72 (Notes 5 and 6).

7.2.4 *Growth*—Determine the growth of the fabric as directed in Method D 2594-72.

Note 5—Launderable fabrics are expected to be drycleanable except where all or part of the fabric is not drycleanable and is so labeled. For example, the fabric could contain a functional finish soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. "Drycleanable" goods are to be drycleaned only.

Note 6—Specimens prepared for 7.2.1 may be used for 7.2.2 and 7.2.3 as desired. When this is done, subtract the pressing and finishing dimensional change from the total dimensional change to obtain that portion due to laundering or drycleaning. The dimensional change to pressing and finishing is determined on the fabric as it will reach the user. It is not additive to the dimensional change to laundering or drycleaning of the fabric as it will reach the consumer (see 5.1).

7.3 *Colorfastness*:

7.3.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23-1975.

Note 7—Washing conditions shall be the same as those used in 7.2.2.1. Drycleaning conditions shall be the same as those used in 7.2.1.

7.3.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1975. The test conditions shall be as directed in AATCC Method 132-1976 (Note 5).

7.3.3 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132-1976 (Note 5).

7.3.4 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1974 for solid shades and AATCC Method 116-1974 for prints or as agreed between the purchaser and the seller.

7.3.5 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1976.

7.3.6 *Light*—Determine colorfastness to light as directed in AATCC Method 16A-1974 or AATCC Method 16E-1976.

Note 8—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1976 shall prevail.

7.4 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124-1975 after laundering using the wash-and-wear cycle or the normal cycle as agreed between the purchaser and seller, as specified in Section 7.2.2.1 for washable fabrics or as specified in Section 7.2.3 for drycleanable fabrics (see Note 5).

7.4.1 For fabrics not intended for use in durable press garments, determine the fabric smoothness after pressing as specified in Section 5.12 of AATCC Method 96-1975.

7.4.1.1 The fabric smoothness DP (durable press) rating of such fabrics, and the DP rating of drycleaned fabrics, shall have decreased no more than ½ DP rating from that of the fabric before it is laundered or drycleaned.

7.5 *Flammability*—The flammability requirements shall be as agreed between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 **Specification Requirements**

NOTE—Class in a, b, c, and DP is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for very severe color change, color transfer, or wrinkle. The numerical rating in Table 1 or a higher numerical rating is acceptable.

Characteristic	Requirements	Section
Bursting strength (load) (ball burst)	50 lbf (222 N)	7.1
Dimensional change:		
Pressing and finishing	2 % max	7.2.1
After five launderings	3 % max	7.2.2
After three drycleanings	2 % max	7.2.3
Growth	3 % max	7.2.4
Colorfastness:		
Burnt gas fumes—2 cycles:		7.3.1
Shade change, original fabric	Class 4[A] min	
Shade change after one laundering or one drycleaning	Class 4[A] min	
Laundering:		7.3.2
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Drycleaning:		7.3.3
Shade change	Class 4[A] min	
Crocking:		7.3.4
Wet	Class 4[C] min	
Dry	Class 3[C] min	
Perspiration (acid phase):		7.3.5
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Light (40 AATCC FU) (xenon-arc)	Step 4[A] min	7.3.6
Fabric appearance (see 7.4.1.1)	DP 3.5[D] min	7.4
Flammability	pass	7.5

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] For durable press fabrics only.

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Designation: D 3783 – 79

An American National Standard

Standard Performance Specification for
WOVEN FLAT LINING FABRICS FOR MEN'S AND BOYS' APPAREL[1]

This standard is issued under the fixed designation D 3783; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers woven flat lining fabrics composed of any textile fiber or mixture of textile fibers for men's and boys' apparel.

1.2 This performance specification is not applicable to woven pile, woven fusible, firebonded fusible, sliver-knit pile, and sheepskin lining fabrics.

1.3 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2, 3]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[2]

D 1336 Test for Distortion of Yarn in Woven Fabrics[2]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[2]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[2]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[2]

D 2724 Testing Bonded and Laminated Apparel Fabrics[2]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[2]

2.2 *AATCC Methods*:[4]

8-1974 Colorfastness to Crocking: AATCC Crockmeter Method

15-1976 Colorfastness to Perspiration

16A-1974 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E-1976 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23-1975 Colorfastness to Burnt Gas Fumes

61-1975 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

96-1975 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool

116-1974 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124-1975 Appearance of Durable Press Fabrics after Repeated Home Launderings

132-1976 Colorfastness to Drycleaning

135-1973 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics

Evaluation Procedure 1 Gray Scale for Color Change

Evaluation Procedure 2 Gray Scale for Staining

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

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[2] *Annual Book of ASTM Standards*, Part 32.

[3] *Annual Book of ASTM Standards*, Part 33.

[4] Available from the American Association of Textile Chemists and Colorists, P. O. Box 12215, Research Triangle Park, N. C. 27709.

Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7.

3. Definitions

3.1 For definitions of textile terms used in this specification refer to Definitions D 123 and the Technical Manual of the American Association of Textile Chemists and Colorists.

4. Uses and Significance

4.1 Flat woven fabrics should meet all of the requirements in Table 1 to be suitable for use in the manufacture of linings for men's and boys' apparel.

4.2 It is recognized that for purposes of fashion or aesthetics, the ultimate consumer of articles made from these fabrics may find acceptable some fabrics that do not conform to all of the requirements in Table 1. For example, the fabric could be dyed in shades that do not meet the requirements in Table 1 for colorfastness to light, yet be acceptable to the ultimate consumer because the shade is fashionable. In such cases, one or more of the requirements may be modified by mutual agreement between the purchaser and the seller.

4.2.1 If any of the requirements in Table 1 are modified by mutual agreement between the purchaser and the seller, any reference to the specification shall specify that "this fabric meets ASTM Specification D 3783 except for the following characteristic(s)."

4.3 The uses and significance of particular properties are discussed in the appropriate sections of the specific methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of flat woven lining fabrics for men's and boys' apparel shall conform to the specifications requirements in Table 1.

7. Test Methods (See Note 1)

7.1 *Breaking Strength* (*Load*)—Determine the dry breaking strength, in the standard atmosphere for testing textiles, in accordance with the grab test procedure of Method D 1682-64 (1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± 0.5 in. (305 ± 13 mm)/min.

NOTE 2—If preferred, the use of a constant-rate-of-extension (CRE) tensile testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and with the CRE machine. Consequently, these two breaking load testers cannot be used interchangeably. In case of controversy, the CRT method shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434-75.

NOTE 3—The precision of Method D 434-75 is being established, and it may not be suitable for fabrics with low yarn counts (see 4.2).

7.3 *Tongue Tear Strength*—Determine the tongue tear strength as directed in Method D 2262-71.

NOTE 4—If preferred, use of Method D 1424-63 (1975) is permitted with existing requirements as given in this standard. There may be no overall correlation between the results obtained with the tongue tear machine and with the Elmendorf machine. Consequently, these two tongue tear testers cannot be used interchangeably. In case of controversy, Method D 2262-71 shall prevail.

7.4 *Yarn Distortion*—Determine the yarn distortion as directed in Method D 1336-72.

7.5 *Dimensional Change*:

7.5.1 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135-1973 (Note 5).

7.5.1.1 The wash conditions and drying procedure shall be as specified by the seller.

7.5.2 *Drycleaning*—Determine the maximum dimensional change after three drycleanings in accordance with Sections 10.1.1 through 10.1.4 of Method D 2724-72.

NOTE 5—Launderable fabrics are expected to be drycleanable except where all or part of the fabric is not drycleanable and is so labeled. For example, the fabric could contain a functional finish soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. "Drycleanable" goods are to be drycleaned only.

7.6 *Colorfastness*:

7.6.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23-1975.

NOTE 6—Washing conditions shall be the same as those used in 7.5.1.1. Drycleaning conditions shall be the same as those used in 7.5.2.

7.6.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1975. The test conditions shall be as specified by the seller (Note 4).

7.6.3 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132-1976. (Note 5).

7.6.4 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1974 for solid shades and AATCC Method 116-1974 for prints or as agreed between the purchaser and the seller.

7.6.5 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1976.

7.6.6 *Light*—Determine colorfastness to light as directed in AATCC Method 16A-1975 or AATCC Method 16E-1976.

NOTE 7—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1976 shall prevail.

7.7 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124-1975 after laundering using the wash-and-wear cycle or the normal cycle as agreed between the purchaser and the seller as specified in 7.5.1.1 for washable fabrics or after drycleaning as specified in 7.5.2 for drycleanable fabrics (see Note 5).

7.7.1 For fabrics not intended for use in durable press garments determine the fabric smoothness after pressing as specified in Section 5.12 of AATCC Method 96-1975.

7.7.1.1 The fabric smoothness (DP) (durable press) rating of such fabrics, and the DP rating of drycleaned fabrics, shall have decreased no more than 1/2 rating from that of the fabric before it is laundered or drycleaned.

7.8 *Flammability*—The flammability requirements shall be as agreed between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 Specification Requirements

NOTE—Class in a, b, c and DP rating is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for severe color change, color transfer, or wrinkle.

Characteristic	Requirements	Section
Breaking strength (load) (CRT)	25 lbf (111 N), min	7.1
Yarn slippage	¼-in. (6.3-mm) separation at 15 lbf (67 N), min	7.2
Tongue tear strength	1.5 lbf (6.7 N), min	7.3
Yarn distortion:		7.4
Satins	0.10 in. (2.5 mm), max	
All other	0.05 in. (1 mm), max	
Dimensional change:		
After five launderings	3 %, max	7.5.1
After three drycleanings	2 %, max	7.5.2
Colorfastness:		
Burnt gas fumes—2 cycles:		7.6.1
Shade change, original fabric	Class 4[A] min	
Shade change after one laundering or one drycleaning	Class 4[A] min	
Laundering:		7.6.2
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Drycleaning:		7.6.3
Shade change	Class 4[A] min	
Crocking:		7.6.4
Dry	Class 4[C] min	
Wet	Class 3[C] min	
Perspiration:		7.6.5
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Light (10 AATCC FU) (xenon-arc)	Step 4[A] min	7.6.6
Fabric appearance (see 7.7.1.1)	DP 3.5[D] min	7.7
Flammability	pass	7.8

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] For durable press fabrics only.

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Designation: D 3784 – 81$^{\epsilon 1}$

Standard Performance Specification for
MEN'S AND BOYS' WOVEN BATHROBE AND DRESSING GOWN FABRICS[1]

This standard is issued under the fixed designation D 3784; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

$^{\epsilon 1}$ Note—Editorial changes were made throughout in June 1982.

1. Scope

1.1 This performance specification covers men's and boys' woven bathrobe and dressing gown fabrics composed of any textile fiber or mixture of textile fibers.

1.2 This performance specification is not applicable to woven fabrics used for interlinings.

1.3 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2, 3]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[2]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[2]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[2]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant Rate-of-Traverse Tensile Testing Machine)[2]

D 2724 Testing Bonded and Laminated Apparel Fabrics[2]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[2]

2.2 *AATCC Methods*:[4]

8-1974 Colorfastness to Crocking: AATCC Crockmeter Methods

15-1976 Colorfastness to Perspiration

16A-1974 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E-1976 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23-1975 Colorfastness to Burnt Gas Fumes

61-1975 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

96-1975 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool

116-1974 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124-1975 Appearance of Durable Press Fabrics after Repeated Home Launderings

132-1976 Colorfastness to Drycleaning

135-1973 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics

Evaluation Procedure 1 Gray Scale for Color Change

Evaluation Procedure 2 Gray Scale for Staining

Evaluation Procedure 3 AATCC Chromatic Transference Scale

Note 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

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[2] *Annual Book of ASTM Standards*, Part 32.

[3] *Annual Book of ASTM Standards*, Part 33.

[4] Available from the American Association of Textile Chemists and Colorists, P. O. Box 12215, Research Triangle Park, N. C. 27709.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to Definitions D 123 and the Technical Manual of the American Association of Textile Chemists and Colorists.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, woven fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: This fabric meets ASTM Specification D 3784 except for the following characteristic(s).

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for men's and boys' woven bathrobes and dressing gowns shall conform to the specification requirements in Table 1.

7. Test Methods (see Note 1)

7.1 *Breaking Strength (Load)*—Determine the dry and wet breaking strength, in the standard atmosphere for testing textiles, as directed in the grab test procedure of Method D 1682-64 (1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± 0.5 in. (305 ± 13 mm)/min.

NOTE 2—If preferred, the use of a constant-rate-of-extension (CRE) tensile testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and with the CRE machine. Consequently, these two breaking load testers cannot be used interchangeably. In case of controversy, the CRT method shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434-75.

NOTE 3—The precision of Method D 434-75 is being established, and it may not be suitable for fabrics with low yarn counts (see 4.2) in terms of ends and picks per inch.

7.3 *Tongue Tear Strength*—Determine the tongue tear strength as directed in Method D 2262-71.

NOTE 4—If preferred, use of Method D 1424-63 (1975) is permitted with existing requirements as given in this standard. There may be no overall correlation between the results obtained with the tongue tear machine and with the Elmendorf machine. Consequently, these two tongue tear testers cannot be used interchangeably. In case of controversy, Method D 2262-71 shall prevail.

7.4 *Dimensional Change*:

7.4.1 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135-1973 (Note 5).

7.4.1.1 The wash conditions and drying procedure shall be as specified by the seller.

7.4.2 *Drycleaning*—Determine the maximum dimensional change after three drycleanings as directed in Sections 10.1.1 through 10.1.4 of Method D 2724-72.

NOTE 5—Launderable fabrics are expected to be drycleanable unless specifically labeled "Do Not Dryclean." "Drycleanable" goods are to be drycleaned only.

7.5 *Colorfastness*:

7.5.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23-1975.

NOTE 6—Washing conditions shall be the same as those used in 7.4.1.1. Drycleaning conditions shall be the same as those used in 7.4.2.

7.5.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1975. The test conditions shall be as specified by the seller (Note 5).

7.5.3 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132-1976. (Note 5).

7.5.4 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1974 for solid shades and AATCC Method 116-1974 for prints or as agreed between the purchaser and the seller.

7.5.5 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1976.

7.5.6 *Light*—Determine colorfastness to light as directed in AATCC Method 16A-1974 or AATCC Method 16E-1976.

NOTE 7—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1976 shall prevail.

7.6 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124-1975 after laundering using the wash-and-wear cycle or the normal cycle as agreed between the purchaser and the seller as specified in 7.4.1.1 for washable fabrics or after drycleaning as specified in 7.4.2 for drycleanable fabrics (see Note 5).

7.6.1 For fabrics not intended for use in "durable press" garments, determine the fabric smoothness after pressing as specified in Section 5.12 of AATCC Method 96-1975.

7.6.1.1 The fabric smoothness DP (durable press) rating of such fabrics, and the DP rating of drycleaned fabrics, shall have decreased no more than 1/2 DP rating from that of the fabric before it is laundered or drycleaned.

7.7 *Flammability*—The flammability requirements shall be as agreed between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 **Specification Requirements**

NOTE—Class in colorfastness and DP requirements is based on a numerical scale of 5 for negligible or no color change, color transfer, or fabric wrinkle to 1 for severe color change, color transfer, or fabric wrinkle.

Characteristic	Requirements	Section
Breaking strength (load) (CRT)	20 lbf (89 N), min	7.1
Yarn slippage	¼-in. (6.3-mm) separation at 15 lbf (67 N), min	7.2
Tongue tear strength	1.5 lbf (6.7 N), min	7.3
Dimensional change:		
After five launderings	3 %, max	7.4.1
After three drycleanings	2 %, max	7.4.2
Colorfastness:		
Burnt gas fumes—2 cycles:		7.5.1
Shade change, original fabric	Class 4[A] min	
Shade change after one laundering or one drycleaning	Class 4[A] min	
Laundering:		7.5.2
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Drycleaning:		7.5.3
Shade change	Class 4[A] min	
Crocking:		7.5.4
Dry	Class 4[C] min	
Wet	Class 3[C] min	
Perspiration:		7.5.5
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Light (20 AATCC FU) (xenon-arc)	Step 4[A]	7.5.6
Fabric appearance (see 7.6.1.1)	DP 3.5,[D] min	7.6
Flammability	pass	7.7

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] For durable press fabrics only.

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Designation: D 3785 - 81

Standard Performance Specification for WOVEN NECKTIE AND SCARF FABRICS[1]

This standard is issued under the fixed designation D 3785; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers woven necktie and scarf fabrics composed of any textile fiber or mixture of textile fibers.

1.2 This performance specification is not applicable to woven fabrics used for interlinings.

1.3 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2, 3]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[2]

D 1336 Test for Distortion of Yarn in Woven Fabrics[2]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[2]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[2]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[2]

D 2724 Testing Bonded and Laminated Apparel Fabrics[2]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[2]

2.2 *AATCC Methods*:[4]

8-1974 Colorfastness to Crocking: AATCC Crockmeter Method

15-1976 Colorfastness to Perspiration

16A-1974 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E-1976 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23-1975 Colorfastness to Burnt Gas Fumes

61-1975 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

96-1975 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool

116-1974 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124-1975 Appearance of Durable Press Fabrics after Repeated Home Launderings

132-1976 Colorfastness to Drycleaning

135-1973 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics

Evaluation Procedure 1 Gray Scale for Color Change

Evaluation Procedure 2 Gray Scale for Staining

Evaluation Procedure 3 AATCC Chromatic Transference Scale[4]

NOTE 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to Definitions D 123

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

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[2] *Annual Book of ASTM Standards*, Part 32.

[3] *Annual Book of ASTM Standards*, Part 33.

[4] Available from the American Association of Textile Chemists and Colorists, P. O. Box 12215, Research Triangle Park, N. C. 27709.

and the Technical Manual of the American Association of Textile Chemists and Colorists.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, woven fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: This fabric meets ASTM Specification D 3785 except for the following characteristic(s).

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedure in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for woven neckties and scarfs shall conform to the specification requirements in Table 1.

7. Test Methods (See Note 1)

7.1 *Breaking Strength* (*Load*)—Determine the dry breaking strength, in the standard atmosphere for testing textiles, as directed in the grab test procedure of Method D 1682-64 (1975), using a constant-rate-of traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± 0.5 in. (305 ± 13 mm)/min.

NOTE 2—If preferred, the use of a constant-rate-of-extension (CRE) tensile testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine. Consequently these two breaking load testers cannot be used interchangeably. In case of controversy, the CRT method shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434-75.

NOTE 3—The precision of D 434-75 is being established and it may not be suitable for fabrics with low yarn counts (see 4.2) in terms of ends and picks per inch.

7.3 *Tongue Tear Strength*—Determine the tongue tear strength as directed in Method D 2262-71.

NOTE 4—If preferred, use of Method D 1424-63 (1975) is permitted with existing requirements as given in this standard. There may be no overall correlation between the results obtained with the tongue tear machine and with the Elmendorf machine. Consequently, these two tear testers cannot be used interchangeably. In case of controversy, Method D 2262-71 shall prevail.

7.4 *Yarn Distortion*—Determine the yarn distortion as directed in Method D 1336-72.

7.5 *Dimensional Change*:

7.5.1 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135-1973 (Note 5).

7.5.1.1 The wash conditions and drying procedure shall be as specified by the seller.

7.5.2 *Drycleaning*—Determine the maximum dimensional change after three drycleanings as directed in Sections 10.1.1 through 10.1.4 of Method D 2724-72.

NOTE 5—Launderable fabrics are expected to be drycleanable unless specifically labeled "Do Not

Dryclean." "Drycleanable" goods are to be drycleaned only.

7.6 *Colorfastness*:

7.6.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23-1975.

NOTE 6—Washing conditions shall be the same as those used in 7.5.1.1. Drycleaning conditions shall be the same as those used in 7.5.2.

7.6.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1975. The test conditions shall be as specified by the seller (Note 5).

7.6.3 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132-1976 (Note 5).

7.6.4 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1974 for solid shades and AATCC Method 116-1974 for prints or as agreed between the purchaser and the seller.

7.6.5 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1976.

7.6.6 *Light*—Determine colorfastness to light as directed in AATCC Method 16A-1974 or AATCC Method 16E-1976.

NOTE 7—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E shall prevail.

7.7 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124-1975 after laundering using the wash-and-wear cycle or the normal cycle as agreed between the purchaser and the seller as specified in 7.5.1.1 for washable fabrics or after drycleaning as specified in 7.5.2 for drycleanable fabrics (see Note 5).

7.7.1 For fabrics not intended for use in "durable press" garments, determine the fabric smoothness after pressing as specified in Section 5.12 of AATCC Method 96-1975.

7.7.1.1 The fabric smoothness DP (durable press) rating of such fabrics, and the DP rating of drycleaned fabrics, shall have decreased no more than ½ DP rating from that of the fabric before it is laundered or drycleaned.

7.8 *Flammability*—The flammability requirements shall be as agreed between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 Specification Requirements

NOTE—Class in colorfastness and DP requirements is based on a numerical scale of 5 for negligible or no color change, color transfer, or fabric wrinkle to 1 for severe color change, color transfer, or fabric wrinkle.

Characteristic	Requirements	Section
Breaking strength (load) (CRT)	20 lbf (89 N), min	7.1
Yarn slippage	¼-in. (6.3-mm) separation at 15 lbf (67 N), min	7.2
Tongue tear strength	1.5 lbf (6.7 N), min	7.3
Yarn distortion:		7.4
Satins	0.10 in. (2.5 mm), min	
All other	0.05 in. (1 mm), min	
Dimensional change:		
After five launderings	3 % max	7.5.1
After three drycleanings	2 % max	7.5.2
Colorfastness:		
Burnt gas fumes—2 cycles:		7.6.1
Shade change, original fabric	Class 4[A] min	
Shade change after one laundering or one drycleaning	Class 4[A] min	
Laundering:		7.6.2
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Drycleaning:		7.6.3
Shade change	Class 4[A] min	
Crocking:		7.6.4
Dry	Class 4[C] min	
Wet	Class 3[C] min	
Perspiration:		7.6.5
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Light (20 AATCC FU) (xenon-arc)	Step 4[A] min	7.6.6
Fabric appearance (see 7.7.1.1)	DP 3.5[D] min	7.7
Flammability	pass	7.8

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] For durable press fabrics only.

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

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Standard Performance Specification for
MEN'S AND BOYS' WOVEN PAJAMA FABRICS[1]

This standard is issued under the fixed designation D 3819; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers men's and boys' woven pajama fabrics composed of any textile fiber or mixture of textile fibers.

1.2 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2,3]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[2]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[2]

D 1682 Test for Breaking Load and Elongation of Textile Fabrics[2]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single-Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[2]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[2]

2.2 *AATCC Methods*:[4]

8-1974 Colorfastness to Crocking: AATCC Crockmeter Method

15-1976 Colorfastness to Perspiration

16A-1974 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E-1976 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23-1975 Colorfastness to Burnt Gas Fumes

61-1975 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

96-1975 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool

116-1974 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124-1975 Appearance of Durable Press Fabrics after Repeated Home Launderings

135-1973 Dimensional Changes in Automatic Home Laundering of Durable Press Woven of Knit Fabrics

Evaluation Procedure 1 Gray Scale for Color Change

Evaluation Procedure 2 Gray Scale for Staining

Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, woven fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved Feb. 27, 1981. Published July 1981. Originally published as D 3819 – 79. Last previous edition D 3819 – 79.

[2] *Annual Book of ASTM Standards*, Part 32.

[3] *Annual Book of ASTM Standards*, Part 33.

[4] Available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: This fabric meets ASTM Specification D 3819 except for the following characteristic(s).

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for men's and boys' woven pajamas shall conform to the specification requirements in Table 1.

7. Test Method (see Note 1)

7.1 *Breaking Strength (Load)*—Determine the breaking strength, in the standard atmosphere for testing textiles, as directed in the grab test procedure of Method D 1682-64 (1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± 0.5 in. (305 ± 13 mm)/min.

Note 2—If preferred, the use of a constant-rate-of-extension (CRE) testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT and the CRE machines. In case of controversy, the CRT machine shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434-75.

Note 3—The precision of Method D 434-75 is being established, and it may not be suitable for fabrics with low yarn counts (see 4.2) in terms of ends and picks per inch.

7.3 *Tongue Tear Strength*—Determine the tear strength as directed in Method D 2262-71.

Note 4—If preferred, the use of Method D 1424-63 (1975) is permitted with existing requirements as given in this specification. There may be no overall correlation between the results obtained by the tongue tear method and the Elmendorf method. In case of controversy, Method D 2262-71 shall prevail.

7.4 *Dimensional Change*:

7.4.1 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135-1973.

7.4.1.1 The wash conditions and drying procedure shall be as specified by the seller.

7.5 *Colorfastness*:

7.5.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering as directed in AATCC Method 23-1975.

Note 5—Washing conditions shall be the same as those used in 7.4.1.1.

7.5.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1975. The test conditions shall be as specified by the seller.

7.5.3 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1974 for solid shades and AATCC Method 116-1974 for prints or as agreed between the purchaser and the seller.

7.5.4 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1976.

7.5.5 *Light*—Determine colorfastness to light as directed in AATCC Method 16A-1974 or AATCC Method 16E-1976.

NOTE 6—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1976 shall prevail.

7.6 *Fabric Appearance After Repeated Home Launderings*—Determine the fabric appearance as directed in AATCC Method 124-1975 after laundering using the wash-and-wear cycle or the normal cycle as agreed between the purchaser and the seller as specified in 7.4.1.1.

7.6.1 For fabrics not intended for use in "durable press" garments, determine the fabric smoothness after pressing as specified in Section 5.12 of AATCC Method 96-1975.

7.6.1.1 The fabric smoothness DP (durable press) rating of such fabrics shall have decreased no more than ½ DP rating from that of the fabric before it is laundered.

7.7 *Flammability*—The flammability requirements shall be agreed between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 **Specification Requirements**

NOTE—Class in colorfastness and DP requirements is based on a numerical scale of 5 for negligible or no color change, color transfer, or fabric wrinkle to 1 for severe color change, color transfer, or fabric wrinkle.

Characteristic	Requirements	Section
Breaking strength (load) (CRT)	25 lbf (111 N), min	7.1
Yarn slippage, ¼-in. (3-mm) separation	15 lbf (67 N), min	7.2
Tongue tear strength	1.5 lbf (6.7 N), min	7.3
Dimensional change after five launderings	3 % max	7.4.1
Colorfastness:		
Burnt gas fumes—2 cycles:		7.5.1
Shade change, original fabric	Class 4^A min	
Shade change after one laundering	Class 4^A min	
Laundering:		7.5.2
Shade change	Class 4^A min	
Staining	Class 3^B min	
Crocking:		7.5.3
Dry	Class 4^C min	
Wet	Class 3^C min	
Perspiration:		7.5.4
Shade change	Class 4^A min	
Staining	Class 3^B min	
Light (20 AATCC FU) (xenon-arc)	Step 4^A min	
Fabric appearance (see 7.6.1.1)	DP 3.0, min	7.6
Flammability	pass	7.7

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

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Designation: D 3820 – 81

Standard Performance Specification for
MEN'S AND BOYS' WOVEN UNDERWEAR FABRICS[1]

This standard is issued under the fixed designation D 3820; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers men's and boys' woven underwear fabrics composed of any textile fiber or mixture of textile fibers.

1.2 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2, 3]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[2]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[2]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[2]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[2]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[2]

2.2 *AATCC Methods*:[4]

8-1974 Colorfastness to Crocking: AATCC Crockmeter Method

15-1976 Colorfastness to Perspiration

16A-1974 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E-1976 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23-1975 Colorfastness to Burnt Gas Fumes

61-1975 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

96-1975 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool

116-1974 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124-1975 Appearance of Durable Press Fabrics After Repeated Home Launderings

135-1973 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics

Evaluation Procedure 1 Gray Scale for Color Change

Evaluation Procedure 2 Gray Scale for Staining

Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC Methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, woven fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D 13.56 on Performance Standards for Textile Fabrics.

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[2] *Annual Book of ASTM Standards*, Part 32.

[3] *Annual Book of ASTM Standards*, Part 33.

[4] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: This fabric meets ASTM Specification D 3820 except for the following characteristic(s).

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for men's and boys' woven underwear shall conform to the specification requirements in Table 1.

7. Test Method (See Note 1)

7.1 *Breaking Strength (Load)*—Determine the breaking strength, in the standard atmosphere for testing textiles, as directed in the grab test procedure of Method D 1682 – 64 (1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± 0.5 in. (305 ± 13 mm)/min.

NOTE 2—If preferred, the use of a constant-rate-of-extension (CRE) testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT and the CRE machines. In case of controversy, the CRT machine shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434 – 75.

NOTE 3—The precision of Method D 434 – 75 is being established, and it may not be suitable for fabrics with low-yarn counts (see 4.2) in terms of ends and picks per inch.

7.3 *Tongue Tear Strength*—Determine the tear strength as directed in Method D 2262 – 71.

NOTE 4—If preferred, the use of Method D 1424 – 63 (1975) is permitted with existing requirements as given in this specification. There may be no overall correlation between the results obtained by the tongue tear method and the Elmendorf method. In case of controversy, Method D 2262–71 shall prevail.

7.4 *Dimensional Change*:

7.4.1 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135-1973.

7.4.1.1 The wash conditions and drying procedure shall be as specified by the seller.

7.5 *Colorfastness*:

7.5.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering as directed in AATCC Method 23-1975.

NOTE 5—Washing conditions shall be the same as those used in 7.4.1.1.

7.5.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1975. The test conditions shall be as specified by the seller.

7.5.3 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1974 for solid shades and AATCC Method 116-1974 for prints or as agreed between the purchaser and the seller.

7.5.4 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1976.

7.5.5 *Light*—Determine colorfastness to light as directed in AATCC Method 16A-1974 or AATCC Method 16E-1976.

NOTE 6—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1976 shall prevail.

7.6 *Fabric Appearance After Repeated Home Launderings*—Determine the fabric appearance as directed in AATCC Method 124-1975 after laundering using the wash-and-wear cycle or the normal cycle as agreed between the purchaser and the seller as specified in 7.4.1.1.

7.6.1 For fabrics not intended for use in "durable press" garments, determine the fabric smoothness after pressing as specified in Section 5.12 of AATCC Method 96-1975.

7.6.1.1 The fabric smoothness DP (durable press) rating of such fabrics shall have decreased no more than ½ DP rating from that of the fabric before it is laundered.

7.7 *Flammability*—The flammability requirements shall be agreed between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 Specification Requirements

NOTE—Class in colorfastness and DP requirement is based on a numerical scale of 5 for negligible or no color change, color transfer, or fabric wrinkle to 1 for severe color change, color transfer, or fabric wrinkle.

Characteristic	Requirements	Section
Breaking strength (load) (CRT)	25 lbf (111 N), min	7.1
Yarn slippage, ¼-in. (3-mm) separation	15 lbf (67 N), min	7.2
Tongue tear strength	1.5 lbf (6.7 N), min	7.3
Dimensional change after five launderings	3 %, max in each direction	7.4.1
Colorfastness:		
Burnt gas fumes—2 cycles:		7.5.1
Shade change, original fabric	Class 4[A] min	
Shade change after one laundering or one drycleaning	Class 4[A] min	
Laundering:		7.5.2
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Crocking:		7.5.3
Dry	Class 4[C] min	
Wet	Class 3[C] min	
Perspiration:		7.5.4
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Light (20 AATCC FU) (xenon-arc)	Step 4[A] min	7.5.5
Fabric Appearance (see 7.6.1.1)	DP 3.0 min	7.6
Flammability	pass	7.7

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

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Designation: D 3821 – 81

Standard Performance Specification for
WOVEN TERRY HOUSEHOLD KITCHEN AND BATH TOWEL FABRICS[1]

This standard is issued under the fixed designation D 3821; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers woven terry fabrics to be used in the manufacturing of beach, bath, hand, finger tip, kitchen towels, and facecloths.

1.2 This performance specification is not applicable to woven terry fabrics used for apparel.

1.3 These requirements apply to the length and width directions for woven fabrics for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2, 3]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[2]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[2]

2.2 *AATCC Methods*:[4]

8-1974 Colorfastness to Crocking: AATCC Crockmeter Method

16A-1974 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E-1976 Colorfastness to Light: Water Cooled Xenon-Arc Lamp, Continuous Light

61-1975 Colorfastness to Washing, Domestic and Laundering, Commercial: Accelerated

97-1975 Noncotton Content of Bleached Cotton Textiles

116-1974 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

135-1973 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabric

Evaluation Procedure 1 Gray Scale for Color Change

Evaluation Procedure 2 Gray Scale for Staining

Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of ASTM test methods that prevail in this document are referenced in Section 7.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, woven fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D 13.56 on Performance Standards for Textile Fabrics.

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[2] *Annual Book of ASTM Standards*, Part 32.

[3] *Annual Book of ASTM Standards*, Part 33.

[4] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

4.2.1 In such cases, any references to the specification shall specify that: This fabric meets ASTM Specification D 3821 except for the following characteristic(s).

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens specified in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is not more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of woven terry fabrics for kitchen and bath towels shall conform to the specification requirements in Table 1.

7. Test Methods (Note 1)

7.1 *Breaking Strength (Load)*—Determine the breaking strength, as directed in the grab test procedure of Method D 1682-64 (1975), using a constant-rate-of traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± 0.5 in. (305 ± 13 mm)/min.

NOTE 2—If preferred, a constant-rate-of-extension (CRE) tensile testing machine may be used. The crosshead speed should be as agreed between the purchaser and seller. There may be no overall correlation between the results obtained with the CRT machine and with the CRE machine. Consequently, these two breaking load testers cannot be used interchangeably. In case of controversy the CRT method shall prevail.

7.2 *Dimensional Change*—Determine the dimensional change after five launderings as directed in Test III B of AATCC Method 135-1973 unless otherwise agreed between the purchaser and seller.

7.3 *Nonfibrous Material*—Determine the nonfibrous material as directed in Sections 4.1 to 4.3 of AATCC Method 97-1975.

NOTE 3—Determine only the water-soluble and enzyme-extractable material.

7.4 *Colorfastness*:

7.4.1 *Laundering*—Determine the colorfastness to laundering as directed in Test IV A of AATCC Method 61-1975 unless otherwise agreed between the purchaser and seller.

7.4.1.1 In this test use multifiber Test Fabric No. 10[5] and evaluate only cotton, polyester, and self fiber.

NOTE 4—For all unbleachable items, Test III A will be used.

7.4.2 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1974 for solid shades and AATCC Method 116-1974 for prints or as agreed between the purchaser and seller.

7.4.3 *Light*—Determine colorfastness to light as directed in AATCC Method 16A-1974 or AATCC Method 16E-1976.

NOTE 5—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no known overall correlation between them. In case of controversy, AATCC Method 16E-1976 shall prevail.

7.5 *Absorbency*—No acceptable standard method is available for the determination of terry towel absorbency.[6]

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[5] Available from Test Fabrics Inc., P.O. Box 118, Middlesex, N.J. 00846.

[6] The development of a standard method has been referred to Subcommittee D13.59 on Fabric Test Methods, General.

TABLE 1 Specification Requirements

Characteristics	Requirements	Section
Breaking strength (load), CRT method:[A]		
Length	40 lbf (178 N) min	7.1
Width	30 lbf (133 N) min	
Dimensional change:		
Length	10 % max	7.2
Width	6 % max	
Nonfibrous material	3 % max	7.3
Colorfastness:[B]		
Laundering:		7.4.1
Alteration in shade	Class 4,[C] min	
Staining	Class 3,[D] min	
Crocking:		7.4.2
Dry	Class 4,[E] min	
Wet	Class 3,[E] min	
Light (20 AATCC FU), xenon	Step 4,[C] min	7.4.3
Absorbency[A]		7.5

[A] See footnote 5.

[B] Class in colorfastness is based on a numerical scale of 5.0 for negligible color change or color transfer to 1.0 for very severe color change or color transfer. The numerical rating in Table 1 or higher is acceptable.

[C] AATCC Gray Scale for Color Change.

[D] AATCC Gray Scale for Staining.

[E] AATCC Chromatic Transference Scale.

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Standard Performance Specification for
WOVEN, THERMAL, FLOCKED, NONWOVEN AND KNITTED HOUSEHOLD BLANKET FABRICS[1]

This standard is issued under the fixed designation D 3993; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers the requirements for woven, thermal, flocked, nonwoven and knitted fabrics used in the manufacturing of household blankets.

1.2 This performance specification is not applicable to woven and knit fabrics used for bindings or interlinings.

1.3 For those properties where fabric direction is pertinent, these requirements apply to both length and width direction.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]

D 1518 Test for Thermal Transmittance of Textile Fabric and Batting Between Guarded Hot-Plate and Cool Atmosphere[2]

D 1682 Tests for Breaking Force and Elongation of Textile Fabrics[2]

D 2724 Testing Bonded and Laminated Apparel Fabrics[2]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[2]

D 3786 Test for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method[2]

D 3787 Test for Bursting Strenght of Knitted Goods: Constant-Rate-of-Traverse (CRT), Ball Burst Test[2]

2.2 *AATCC Methods*:[3]

8	Colorfastness to Crocking: AATCC Crockmeter Method
16A	Colorfastness to Light: Carbon-Arc Lamp, Continuous Light
16E	Colorfastness to Light: Water Cooled Xenon-Arc Lamp, Continuous Light
23	Colorfastness to Burnt Gas Fumes
61	Colorfastness to Washing, Domestic and Laundering, Commercial: Accelerated
116	Colorfastness to Crocking: Rotary Vertical Crockmeter Method
132	Colorfastness to Drycleaning
135	Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabric

Evaluation Procedure 1 Gray Scale for Color Change

Evaluation Procedure No. 2 Gray Scale for Staining

Evaluation Procedure No. 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of ASTM test methods that prevail in this document are referenced in Section 7 on Test Methods.

3. Definitions

3.1 *blanket, n—for bedding*, an unquilted fabric covering designed primarily to provide thermal insulation.

3.1.1 *Discussion*—Blankets may be made by any textile process from various types of fibers and may or may not have a raised fiber surface.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D1356 on Performance Standards for Textile Fabrics.

Current edition approved Feb. 27, 1981. Published July 1981.

[2] *Annual Book of ASTM Standards*, Part 32.

[3] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

Construction may be knitted, flocked, woven, nonwoven, or thermal.

3.1.2 *Discussion*—Electric blankets include resistant heat wires and can provide heat as well as thermal insulation.

3.2 *delicate or gentle cycle*—a cycle in which agitation is slow and time is reduced.

3.3 For definitions of other textile terms used in this specification refer to the individual ASTM and AATCC test methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics, the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 3993 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the user.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens as directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is not more than 5 % of the average above or below the lot average, that is, the average that would be obtained by applying this method to the entire lot when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for woven, thermal, flocked, nonwoven, and knit blankets shall conform to the specification requirements in Table 1.

7. Test Methods (see Note 1)

7.1 *Breaking Strength* (*Load*) (*Woven and Nonwoven Fabrics Only*)—Determine the breaking strength, as directed in the grab test procedure of Method D 1682 – 64 (1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± 0.5 in./s (5.1 ± 0.2 mm/s).

NOTE 2—If preferred, a constant-rate-of-extension (CRE) tensile testing machine may be used. The crosshead speed should be as agreed between the purchaser and seller. There may be no overall correlation between the results obtained with the CRT and CRE machines. Consequently, these two breaking load testers cannot be used interchangeably. In case of controversy, the CRT method shall prevail.

7.2 *Bursting Strength* (*Knit and Flocked Fabrics Only*)—Determine the bursting strength of knit and flocked fabrics as directed in Method D 3787 – 79 using an approved type of constant-rate-of-traverse(CRT) machine equipped with a bursting attachment or as directed in Method D 3786 – 79 using an approved type of diaphragm bursting tester as agreed between the purchaser and the seller.

NOTE 3—Care should be taken to subtract the tare diaphragm pressure from the gross pressure to obtain actual bursting strength of fabric when using the diaphragm bursting tester. Calibrate equipment according to manufacturer's instruction before using. Since there is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphragm bursting tester, these two bursting testers cannot be used interchangeably. In case of controversy, the CRT machine equipped with a bursting attachment method shall prevail.

NOTE 4—The precision of the ball burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm bursting tester method are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the type of material to be evaluated.

7.3 *Dimensional Change*:

7.3.1 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135-1978 or as agreed upon between the purchaser and the seller. The wash conditions and drying procedure shall be as specified by the seller.

NOTE 5—Launderable fabrics are expected to be drycleanable except where all or part of the fabric is not drycleanable and is so labeled. For example, the fabric could contain a functional finish soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl) chloride fiber. "Drycleanable" goods are to be drycleaned only.

7.3.1.1 For this test the sample size shall be at least 66 by 90 in. (1580 by 2290 mm); a full size blanket is preferred. The longest gage marks available should be used with the minimum gage marks being 18 in. (46 cm). Minimum specimen size shall be one quarter of a blanket.

NOTE 6—There shall be no appreciable distortion of the fabric due to differential shrinkage in stripes and other patterns.

7.3.2 *Drycleaning*—Determine the dimensional change after three drycleanings as directed in 10.1.1 to 10.1.4 of Method D 2724 - 72 with the exclusion of pressing (see Notes 4, 5, and 6).

7.3.2.1 For sample size, see 7.3.1.1.

NOTE 7—The method in 7.3.2 is a modification of the method used in 10.1.1 to 10.1.4 of Method D 2724 - 72. The precision and accuracy has not been established. The method is not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the type of material to be evaluated.

7.4 *Colorfastness*:

7.4.1 *Laundering*—Determine the colorfastness to laundering as directed in Test 1A of AATCC Method 61-1975 unless otherwise agreed between the purchaser and seller (See Note 5).

7.4.2 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132-1976 (see Note 5).

7.4.3 *Burnt Gas Fumes*—Determine colorfastness to burnt gas fumes after two cycles on the original fabric as directed in AATCC Method 23-1975.

7.4.4 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1974 for solid shades and AATCC Method 116-1974 for prints or as agreed between the purchaser and seller.

7.4.5 *Light*—Determine colorfastness to light as directed in AATCC Method 16A-1974 or AATCC Method 16E-1976.

NOTE 8—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon-arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no known overall correlation between them. In case of controversy, AATCC Method 16E-1976 shall prevail.

7.5 *Flammability*—The flammability requirements shall be as agreed between purchaser and seller, except when regulated by applicable Government mandatory standards. Reference is also made to the present Proposed Standard for the Flammability of Blankets.[4]

7.6 *Thermal Transmittance*—Method D 1518 - 77 is an accepted method for determining thermal transmittance. However, due to wide variations in blanket fabric thickness, construction, inherent fiber thermal properties, and intended use by the ultimate consumer, minimum requirements for thermal transmittance cannot be established.

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[4] *Textile Flammability: A Handbook of Regulations, Standards, and Test Methods*, available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709; or National Bureau of Standards, Gaithersburg, Md. 20234.

TABLE 1 Specification Requirements

Characteristics	Knits	Woven/Nonwoven	Section
Breaking strength (load), (CRT method[F]) each direction	. . .	20 lbf (89 N) min	7.1
Bursting strength, (ball burst[F])	50 psi (345 kPa) min	. . .	7.2
Dimensional change:			
After 5 launderings each direction			7.3.1
Wool (50 % or more)	6.0 max	6.0 max	
All others	3.5 max	3.5 max	
After 3 drycleanings each direction			7.3.2
All fabrics	3.5 max	3.5 max	
Colorfastness to:[a]			
Laundering			7.4.1
Alteration in shade	class 4[B] min	class 4[B] min	
Staining	class 3[C] min	class 3[C] min	
Drycleaning			7.4.2
Alteration in shade	class 4[B] min	class 4[B] min	
Burnt Gas Fumes 2 cycles			7.4.3
Alteration in shade	class 4[B] min	class 4[B] min	
Crocking			7.4.4
Dry	class 4[D] min	class 4[D] min	
Wet	class 3[D] min	class 3[D] min	
Light (20 AATCC FU, xenon-arc[F])	step 4[B] min	step 4[B] min	
Flammability	pass	pass	7.5

[A] Class in colorfastness is based on a numerical scale of 5.0 for negligible color change or color transfer to 1.0 for very severe color change or color transfer. The numerical rating in Table 1 or higher is acceptable.

[B] AATCC Gray Scale for Color Change.

[C] AATCC Gray Scale for Staining.

[D] AATCC Chromatic Transference Scale.

[E] See footnote 4.

[F] There is more than one standard method that can be used to measure breaking strength, bursting strength, and lightfastness. These methods cannot be used interchangeably since there may be no overall correlation between them (see Notes 2, 3, 4, 5 and 8).

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Standard Performance Specification for
MEN'S, WOMEN'S AND CHILDREN'S WOVEN SWIMWEAR FABRICS[1]

This standard is issued under the fixed designation D 3994; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers woven fabrics for use in men's, women's and children's swimwear, composed of any textile fiber or mixture of textile fibers.

1.2 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics using a Standard Seam[3]

D 1284 Test for Relaxation and Consolidation Dimensional Changes of Stabilized Knit Wool Fabrics[3]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[3]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[3]

D 2262 Test for Tearing Strength of Woven Fabrics by Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

2.2 *AATCC Methods*:[4]

8	Colorfastness to Crocking: AATCC Crockmeter Method
15	Colorfastness to Perspiration
16A	Colorfastness to Light: Carbon-Arc Lamp, Continuous Light
16E	Colorfastness to Light: Xeron Arc Lamp, Water Cooled, Continuous Light
23	Colorfastness to Burnt Gas Fumes
61	Colorfastness to Washing, Domestic, and Laundering, Commercial Accelerated
106	Colorfastness to Water: Sea
107	Colorfastness to Water
116	Colorfastness to Crocking: Rotary Vertical Crockmeter Method
129	Colorfastness to Ozone in the Atmosphere Under High Humidities
135	Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics

Evaluation Procedure No. 1 Gray Scale for Color Change

Evaluation Procedure No. 2 Gray Scale for Staining

Evaluation Procedure No. 3 AATCC Chromatic Transference Scale.

NOTE 1—The specific dated editions of the ASTM and AATCC test methods that prevail in this document are referenced in Section 7 on Test Methods.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to the individual ASTM

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved Feb. 27, 1981. Published July 1981.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

and AATCC test methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 3994, except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer. Any partially finished fabric should be processed in accordance with the fabric manufacturer's instructions before testing.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is the average that would be obtained by applying this method to the entire lot) using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for woven swimwear shall conform to the specification requirements in Table 1.

7. Test Methods

7.1 *Breaking Strength (Load)*—Determine the dry breaking strength, in the standard atmosphere for testing textiles, as directed in the grab test procedure of Method D 1682 - 1975, using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 + 0.5 in. (305 + 13 mm)/min.

NOTE 2—Fabrics that include fibers which are known to lose strength when wet, such as rayon, should be tested for wet breaking strength, also.

NOTE 3—If preferred, the use of a constant-rate-of-extension (CRE) testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT and the CRE machines. Consequently these two breaking load testers cannot be used interchangeably. In case of controversy, the CRT machine shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434 - 75.

NOTE 4—The precision of Method D 434 - 75 is being established, and it may not be suitable for fabrics with low yarn counts in terms of the number of ends and picks per inch.

7.3 *Tongue Tear Strength*—Determine the tear strength in the nonstretch direction as directed in Method D 2262 - 71 (1976).

NOTE 5—If preferred, the use of Method D 1424 - 63 (1975) is permitted with existing requirements as given in this standard. There may be no overall correlation between the results obtained by the tongue tear method and the Elmendorf method. Consequently these two tear testers cannot be used interchangeably. In case of controversy, Method D 2262 - 71 (1976) shall prevail.

7.4 *Dimensional Change*:

7.4.1 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC 135-1978 or as agreed between the purchaser and seller.

7.4.1.1 The wash conditions and drying procedure shall be as agreed between the purchaser and the seller.

7.4.2 *Wet Relaxation Dimensional Change*—Determine wet relaxation dimensional change as directed in Sections 10.1 through 10.4 of Method D 1284 – 76.

7.4.2.1 With as little distortion as possible, remove the wet specimen(s) from the tray in ball form, and hang over a rod for 1 min. Lay the specimen(s) flat without blocking or distortion on dry racks.

7.4.2.2 Measure the distances that were marked off, to the nearest 0.05 in. (1 mm).

7.4.2.3 Calculate the wet relaxation dimensional change in each direction in accordance with Section 11.1 of Method D 1284 – 76.

7.4.3 *Dry Relaxation Dimensional Change*—Determine the dry relaxation dimensional change by drying the specimen(s) after 7.4.2.2 as directed in Section 10.5 of Method D 1284 – 76.

7.4.3.1 Measure and calculate the dry relaxation dimensional change as directed in Sections 10.6 and 11.1 of Method D 1284 – 76.

NOTE 6—The method in 7.4.2 and 7.4.3 is a modification of the method in Section 10 of Method D 1284 – 76. Its precision and accuracy has not been established. The method is accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the material to be evaluated.

7.5 *Colorfastness*:

7.5.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering as directed in AATCC Method 23-1975.

NOTE 7—Washing conditions shall be the same as those used in 7.4.1.1.

7.5.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1975. The test conditions shall be agreed between the purchaser and the seller.

7.5.3 *Colorfastness to Crocking*—Determine the colorfastness to dry and wet crocking as directed in AATCC Method 8-1977 for solid shades and AATCC Method 116-1977 for prints or as agreed between the purchaser and the seller.

7.5.4 *Colorfastness to Water*—Determine the colorfastness to water as directed in AATCC Method 107-1975.

7.5.5 *Colorfastness to Water-Chlorinated Pool*—No acceptable standard method is available for the determination of colorfastness to chlorinated swimming pool water.

NOTE 8—The development of a standard method for colorfastness to chlorinated swimming pool water has been referred to Committee RA23 of AATCC.

7.5.6 Determine the colorfastness to perspiration as directed in AATCC Method 15-1976.

7.5.7 *Colorfastness to Sea Water*—Determine the colorfastness to sea water as directed in AATCC Method 106-1978.

7.5.8 *Colorfastness to Ozone*—Determine the colorfastness to ozone as directed in AATCC Method 129-1975.

7.5.9 *Colorfastness to Light*—Determine the colorfastness to light as directed in AATCC Method 16A-1977 or AATCC Method 16E-1978.

NOTE 9—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. However, in case of controversy, AATCC Method 16E-1978 shall prevail.

7.6 *Flammability*—The flammability requirements shall be as agreed between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 **Specification Requirements**

NOTE—Class in a, b, and c is based on a numerical scale of 5 for negligible or no color change or color transfer to 1 for very severe color change or color transfer.

Characteristic	Requirements	Section
Breaking strength (load)[D] (CRT):		7.1
Nonstretch fabrics	30 lbf (133 N), min	
Stretch fabrics	20 lbf (89 N), min @ 40 % or greater elongation	
Yarn slippage ¼-in. (6-mm) separation	20 lbf (89), min	7.2
Tongue tear strength (nonstretch direction)	1.5 lbf (6.7 N), min	7.3
Dimensional change:		
Laundering	3 %, max	7.4.1
Wet relaxation or growth	5 %, max	7.4.2
Dry relaxation or growth	3 %, max	7.4.3
Colorfastness:		
Burnt gas fumes—1 cycle		7.5.1
Shade change, original fabric and after 1 laundering	Class 4[A], min	
Laundering		7.5.2
Shade change	Class 4[A], min	
Staining	Class 3[B], min	
Crocking		7.5.3
Dry	Class 4[C], min	
Wet	Class 3[C], min	
Water		7.5.4
Shade change	Class 4[A], min	
Staining	Class 3[B], min	
Water-Chlorinated Pool[E]	. . .	7.5.5
Perspiration		
Shade change	Class 4[A]	
Staining	Class 3[B]	
Sea water		7.5.7
Shade change	Class 4[A], min	
Staining	Class 3[B], min	
Ozone		
Shade change	Class 3–4[A], min	
Light (40 AATCC FU) (xenon-arc)	Step 4[A], min	7.5.9
Flammability	pass	7.6

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] See Note 2.

[E] See Note 8.

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Designation: D 3995 - 81

Standard Performance Specification for
MEN'S AND WOMEN'S KNITTED CAREER APPAREL FABRICS: DRESS AND VOCATIONAL[1]

This standard is issued under the fixed designation D 3995; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers the minimum performance requirements for men's and women's knitted fabrics for dress and vocational career apparel composed of any textile fiber or mixtures of textile fibers.

1.2 This performance specification is not applicable to career apparel fabrics such as those used in protective clothing, that do not patently fit the categories in 3.1.1 and 3.1.2. Minimum performance specifications for such fabrics should be as agreed between the purchaser and the seller.

1.3 These requirements apply to the length and width directions for those factors where each fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]

D 2724 Testing Bonded and Laminated Apparel Fabrics[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

D 3786 Test for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method[3]

D 3787 Test for Bursting Strength of Knitted Goods: Constant-Rate-of-Traverse (CRT), Ball Burst Test[3]

D 3887 Specification for Knitted Fabric[3]

2.2 *AATCC Methods*:[4]

AATCC 8-1977 Colorfastness to Crocking AATCC Crockmeter Method

AATCC 15-1976 Colorfastness to Perspiration

AATCC 16A-1977 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

AATCC 16E-1978 Colorfastness to Light: Xenon-Arc Lamp, Water Cooled Continuous Light

AATCC 23-1975 Colorfastness to Burnt Gas Fumes

AATCC 61-1975 Colorfastness to Washing, Domestic Laundering, Commercial: Accelerated

AATCC 116-1977 Colorfastness to Crocking, Rotary Vertical Crockmeter Method

AATCC 124-1978 Appearance of Durable Press Fabrics After Repeated Home Launderings

AATCC 132-1976 Colorfastness to Drycleaning

AATCC 135-1978 Dimensional Change in Automatic Home Laundering of Durable Press Woven or Knit Fabrics

Evaluation Procedure 1 Gray Scale for Color Change

Evaluation Procedure 2 Gray Scale for Staining

Evaluation Procedure 3 Chromatic Transference Scale

NOTE 1—The specific dated editions of ASTM test methods that prevail in this standard are referenced in Section 7 on Test Methods.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved Feb. 27, 1981. Published July 1981.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

3. Terminology

3.1 *Definitions*:

3.1.1—*career apparel*, *n*—garments which are manufactured for a variety of end uses and for which performance requirements vary.

3.1.1.1 *Discussion*—The two major end uses for career apparel are dress apparel and vocational apparel.

3.1.2 *career apparel, dress*, *n*—a category of tailored uniform in which abusive wear is not common and in which appearance is much more important than durability (see also *career apparel, vocational career apparel*).

3.1.3 *career apparel, vocational*, *n*—a type of garment worn as a uniform in which abusive wear is common and durability is generally more important than appearance (see also *career apparel, dress career apparel*).

3.1.4 *Dimensional Change in Pressing and Finishing*, *n*—the change in dimensions undergone by a fabric subjected to pressing and finishing during garment manufacturing.

3.1.5 For definitions of other terms used in this specification, refer to the individual ASTM and AATCC test methods and Definitions D 123.

3.2 *Description of Term*:

3.2.1 *Pressing and Finishing*, *n*—this term takes into account a variety of industrial pressing and finishing treatments used in garment manufacturing.

NOTE 2—No standard method is available for reproducing on a laboratory level the results of industrial press or finishing treatments, or both, used in the manufacture of knitted apparel garments.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modifed by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 3995 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer. Any "partially finished" or "post-finished" fabrics or those which will be pleated, creased, steamed, or pressed during manufacturing should be processed in accordance with the fabric manufacturer's instructions before tests are made.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of knitted fabric for men's and women's career apparel shall conform to the specification requirement in Table 1.

7. Test Methods (Note 1)

7.1 *Bursting Strength*—Determine the bursting strength as directed in Methods D 3787 – 79 or D 3786 – 79.

NOTE 3—There is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphragm bursting tester. Consequently, these two bursting testers cannot be used interchangeably. In case of controversy, Method D 3787 – 79 shall prevail.

NOTE 4—The precision of the ball burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm bursting tester method are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the material to be evaluated.

7.2 *Dimensional Change*:

7.2.1 *Pressing and Finishing During Garment Manufacturing*—Where applicable mark the specimen(s) as directed in Section 4.3.1 of AATCC Method 135-78. Press and finish specimen(s) as agreed by the purchaser and the seller with respect to time, cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135-1978.

7.2.1.1 If no agreement has been made between the purchaser and the seller, press the specimen(s) using a flat-bed steam press according to the cycle in 10.1.3.1 through 10.1.3.5 of Method D 2724 – 72.

7.2.2 *Home Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135-1978 or as agreed between the purchaser and seller.

7.2.2.1 The wash conditions and drying procedure shall be as agreed between the purchaser and the seller (See Notes 5 and 6).

7.2.3 *Institutional Laundering*—The wash conditions and drying procedure shall be as agreed between the purchaser and the seller.

7.2.4 *Drycleaning*—Determine the maximum dimensional change after three drycleanings as directed in sections 10.1.3.1 through 10.1.3.5 of Method D 2724 – 72 (See Notes 5 and 6).

NOTE 5—Launderable fabrics are expected to be drycleanable except where all or part of the fabric is not drycleanable and is so labeled. For example, the fabric could contain a functional finish soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl) chloride fiber. "Drycleanable" goods are to be drycleaned only.

NOTE 6—Specimens prepared for 7.2.1 may be used for 7.2.2, 7.2.3, and 7.2.4 as desired. When this is done, the dimensional change due to laundering or drycleaning is calculated using Eq. 1, due to laundering. The dimensional change to pressing and finishing will have occured in the fabric before it reaches the user. Therefore, it should not be included as a part of the dimensional change to laundering or drycleaning of the fabric as it will reach the consumer (see 5.1).

$$\% \text{ dimensional change} = 100\,(D_2 - D_1)/D_2 \qquad (1)$$

where:

D_1 = measurement after laundering or drycleaning, and

D_2 = measurement after pressing and finishing.

7.3 *Fabric Smoothness Appearance*—Determine the fabric smoothness appearance, as directed in AATCC Method 124-1978, after laundering using the wash-and-wear cycle, or the normal cycle as agreed between the purchaser and the seller, as specified in Section 7.2.2 or 7.2.3 for washable fabrics or after drycleaning as specified in Section 7.2.4 for drycleanable fabrics.

7.3.1 For washable fabrics not intended for use in "durable press" garments determine the fabric smoothness after pressing as specified in Section 5.12 of AATCC Method 96-1975.

7.3.1.1 The fabric smoothness Durable Press (DP) rating of such fabrics, and the DP rating of drycleaned fabrics, shall have decreased no more than 1/2 DP rating from that of the fabric before it is laundered or drycleaned.

7.4 *Flammability*—The flammability requirements shall be as agreed between the purchaser and the seller, except when regulated by applicable government mandatory standards.

7.5 *Colorfastness*:

7.5.1 *Home Laundering*—Determine the colorfastness to laundering of home laundered fabrics as directed in test Method AATCC 61-1975.

7.5.2 *Institutional Laundering*—Determine the colorfastness to laundering of institutional laundered fabrics as agreed between the purchaser and the seller.

7.5.3 *Dry Cleaning*—Determine the colorfastness to dry cleaning as directed in AATCC Method 132-1976 (Note 3).

7.5.4 *Crocking*—Determine the colorfastness to dry and wet crocking as directed in AATCC Method 8-1977 for solid shades or AATCC Method 116-1977 for prints or as agreed between the purchaser and the seller.

7.5.5 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering as in 7.2.2 or

7.2.3 or after one dry cleaning as in 7.2.4 as directed in AATCC Method 23-1975.

7.5.6 *Light*—Determine colorfastness to light as directed in AATCC Method 16E-1978 or 16A-1977.

NOTE 7—There is a distinct difference in spectral distribution of the xenon fading lamp apparatus and enclosed carbon-arc (not sunshine-carbon-arc) apparatus. Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy AATCC Method 16E-1978 shall prevail.

7.5.7 *Perspiration*—Determine the colorfastness to perspiration as directed in AATCC Method 15-1976.

7.6 When a claim is made for a special performance characteristic not covered by this specification, it should be tested as directed in a test method and performance standard mutually acceptable to the purchaser and the seller.

TABLE 1 Specification Requirements

NOTE—The classes of colorfastness and DP rating are based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for very severe color change, color transfer, or wrinkle.

Characteristics	Requirements		Section
	Career Dress Apparel	Career Vocational Apparel	
Bursting strength (ball burst)	60 lbf (267 N) min	60 lbf (267 N) min	7.1
Dimensional stability (each direction):			
Pressing and finishing	2 % max shrinkage, 0 % growth	2 % max shrink, 0 % growth	7.2.1
After 5 washes	3 % max	3 % max	7.2.2
After 3 dry cleaning	3 % max	3 % max	7.2.4
Fabric smoothness	Class 4, DP, min	Class 3, DP, min	7.3
Flammability	pass	pass	7.4
Colorfastness:			
Laundering:			7.5.1
Color change	Class 4, min[A]	Class 4, min[A]	
Staining	Class 3–4, min,[B]	Class 3–4, min[B]	
Drycleaning:			7.5.3
Color change	Class 4, min.[A]	Class 4, min[A]	
Crocking			7.5.4
Dry	Class 4, min[C]	Class 4, min[C]	
Wet	Class 3, min[C]	Class 3, min[C]	
Burnt Gas Fumes—1 cycle:			7.5.5
Shade change, original fabric and after and 1 laundering or 1 drycleaning	Class 4, min	Class 4, min[A]	
Light: (xenon-arc)			7.5.6
Outdoor (40 AATCC SFU)	Step 4, min[A]	Step 4, min[A]	
Indoor (20 AATCC SFU)	Step 4, min[A]	Step 4, min[A]	
Perspiration			7.5.7
Color change	Class 4, min[A]	Class 4, min[A]	
Staining	Class 3, min[B]	Class 3, min[B]	

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Designation: D 3996 – 81

Standard Performance Specification for
MEN'S, WOMEN'S, AND CHILDREN'S KNIT SWIMWEAR FABRICS[1]

This standard is issued under the fixed designation D 3996; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers circular and warp knitted fabrics for use in men's, women's, and children's swimwear, composed of any textile fiber or mixture of textile fibers.

1.2 These requirements apply to both the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]
D 1284 Tests for Relaxation and Consolidation Dimensional Changes of Stabilized Knit Wool Fabrics[3]
D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]
D 3786 Test for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method[3]
D 3787 Test for Bursting Strength of Knitted Goods: Constant-Rate-of-Traverse (CRT), Ball Burst Test[3]

2.2 *AATCC Methods*:[4]

8 Colorfastness to Crocking: AATCC Crockmeter Method
15 Colorfastness to Perspiration
16A Colorfastness to Light: Carbon-Arc Lamp, Continuous Light
16E Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light
23 Colorfastness to Burnt Gas Fumes
61 Colorfastness to Washing, Domestic, and Laundering, Commercial-Accelerated
106 Colorfastness to Water: Sea
107 Colorfastness to Water
116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method
129 Colorfastness to Ozone in the Atmosphere Under High Humidities
135 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics
Evaluation Procedure No. 1 Gray Scale for Color Change
Evaluation Procedure 2 Gray Scale for Staining
Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM and AATCC test methods that prevail in this document are referenced in Section 7 on Test Methods.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC test methods and Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fash-

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved Feb. 27, 1981. Published July 1981.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N. C. 27709.

ion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 3996 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabrics as it will reach the consumer. Any partially finished fabric should be processed in accordance with the fabric manufacturer's instructions before testing.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is the average that would be obtained by applying this method to the entire lot) using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for knitted swimwear shall conform to the specification requirements in Table 1.

7. Test Methods

7.1 *Bursting Strength*—Determine the bursting strength, in the standard atmosphere for testing textiles, as directed in Method D 3787 – 80a using an approved type of constant-rate-of-traverse (CRT) machine equipped with a bursting attachment or as directed in Method D 3786 – 80a using an approved type of diaphragm bursting tester as agreed between the purchaser and the seller.

Note 2—Fabrics which include fibers which are known to lose strength when wet, such as rayon, should be tested for wet bursting strength also.

Note 3—There is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphragm bursting tester. Consequently, these two bursting testers cannot be used interchangeably. In case of controversy, the CRT machine equipped with a bursting attachment method shall prevail.

Note 4—The precision of the ball burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm bursting tester method are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the material to be evaluated.

7.2 *Dimensional Change*:

7.2.1 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135 – 1978 or as agreed between the purchaser and the seller.

7.2.1.1 The wash conditions and drying procedure shall be as agreed between the purchaser and the seller.

7.2.2 *Wet Relaxation Dimensional Change*—Determine wet relaxation dimensional change as directed in Sections 10.1 through 10.4 of Method D 1284 – 76.

7.2.2.1 With as little distortion as possible, remove the wet specimen(s) from the tray in ball form, and hang over a rod for 1 min. Lay the specimen(s) flat without blocking or distortion on drying racks.

7.2.2.2 Measure the distances that were marked off, to the nearest 0.05 in. (1 mm).

7.2.2.3 Calculate the wet relaxation dimensional change in each direction as directed in 11.1 of Method D 1284 – 76.

7.2.3 *Dry Relaxation Dimensional Change*—Determine the dry relaxation dimensional change by drying the specimen(s) after 7.2.2.2 as directed in Section 10.5 of Method D 1284 – 76.

7.2.3.1 Measure and calculate the dry relaxation dimensional change as directed in Sections 10.6 and 11.1 of Method D 1284 – 76.

NOTE 5—The method in 7.2.2 and 7.2.3 is a modification of the method in Section 10 of Method D 1284 – 76. Its precision and accuracy has not been established. The method is accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the material to be evaluated.

7.3 *Colorfastness*:

7.3.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering as directed in AATCC Method 23-1975.

NOTE 6—Washing conditions shall be the same as those used in 7.2.1.1.

7.3.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1975. The test conditions shall be as agreed between the purchaser and the seller.

7.3.3 *Colorfastness to Crocking*—Determine the colorfastness to dry and wet crocking as directed in AATCC Method 8-1974 for solid color fabrics or AATCC Method 116-1977 for printed fabrics or as agreed between the purchaser and the seller.

7.3.4 *Colorfastness to Water*—Determine the colorfastness to water as directed in AATCC Method 107-1975.

7.3.5 *Colorfastness to Perspiration*—Determine the colorfastness to perspiration as directed in AATCC Method 15-1976.

7.3.6 *Colorfastness to Water-Chlorinated Pool*—No acceptable standard method is available for the determination of colorfastness to chlorinated swimming pool water.

NOTE 7—The development of a standard method for colorfastness to chlorinated swimming pool water has been referred to Committee RA23 of AATCC.

7.3.7 *Colorfastness to Sea Water*—Determine the colorfastness to sea water as directed in AATCC Method 106-1978.

7.3.8 *Ozone*—Determine the colorfastness to ozone as directed in AATCC Method 129-1975.

7.3.9 *Colorfastness to Light*—Determine the colorfastness to light as directed in AATCC Method 16A-1977 or AATCC Method 16E-1978.

NOTE 8—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. However, in case of controversy, AATCC Method 16E-1978 shall prevail.

7.4 *Flammability*—The flammability requirements shall be as agreed between purchaser and seller, except when regulated by applicable government mandatory standards.

TABLE 1 Specification Requirements

NOTE—The classes of colorfastness and DP rating are based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for very severe color change, color transfer, or wrinkle.

Characteristic	Requirements	Section
Bursting strength (ball burst)	30 lbf (133 N) min	7.1
Dimensional change:		
Laundering		7.2.1
Nonstretch fabrics	5.0 % max in each direction	
Stretch fabrics	7.5 % max in each direction	
Wet relaxation or growth		7.2.2
Stretch fabrics	10.0 % max in each direction	
Dry relaxation or growth	5.0 % max in each direction	7.2.3
Colorfastness:		
Burnt Gas Fumes—1 cycle		7.3.1
Shade change, Original fabric and after 1 laundering	Class 4 min[A]	
Laundering		7.3.2
Shade change	Class 4 min[A]	
Staining	Class 3 min[B]	
Crocking		7.3.3
Dry	Class 4 min[C]	
Wet	Class 3 min[C]	
Water		7.3.4
Shade change	Class 4, min[A]	
Staining	Class 3 min[B]	
Perspiration		7.3.5
Shade change	Class 4 min[A]	
Staining	Class 3 min[B]	
Chlorinated pool water[D]	. . .	7.3.6
Sea Water		7.3.7
Shade change	Class 4 min[A]	
Staining	Class 3, min[B]	
Ozone		7.3.8
Shade change	Class 3–4 min[A]	
Light (40 AATCC FU) (xenon-arc)	Step 4 min[A]	7.3.9
Flammability	pass	7.4

[A] AATCC Gray Scale for Color Change.
[B] AATCC Gray Scale for Staining.
[C] AATCC Chromatic Transference Scale.
[D] See Note 7.

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Designation: D 4035 - 81

Standard Performance Specification for
KNITTED NECKTIE AND SCARF FABRICS[1]

This standard is issued under the fixed designation D 4035; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers knitted necktie and scarf fabrics composed of any textile fiber or mixture of textile fibers.

1.2 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]
D 2594 Tests for Stretch Properties of Knitted Fabrics Having Low Power[3]
D 2724 Testing Bonded and Laminated Apparel Fabrics[3]
D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]
D 3786 Test for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics—Diaphragm Bursting Strength Tester Method[3]
D 3787 Test for Bursting Strength of Knitted Goods—Constant-Rate-of-Traverse (CRT) Ball Burst Test[3]

2.2 *AATCC Methods*:[4]

8-1977 Colorfastness to Crocking: AATCC Crockmeter Method
15-1979 Colorfastness to Perspiration
16A-1977 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light
16E-1978 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light
23-1975 Colorfastness to Burnt Gas Fumes
61-1975 Colorfastness to Washing, Domestic, and Laundering Commercial: Accelerated
96-1975 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool
116-1977 Colorfastness to Crocking: Rotary Vertical Crockmeter Method
124-1978 Appearance of Durable Press Fabrics after Repeated Home Launderings
132-1977 Colorfastness to Drycleaning
135-1978 Dimensional Changes in Automatic Home Launderings of Durable Press Woven of Knit Fabrics
Evaluation Procedure 1 Gray Scale for Color Change
Evaluation Procedure 2 Gray Scale for Staining
Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

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[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Available from American Association of Textile Chemists and Colorists, P. O. Box 12215, Research Triangle Park, N. C. 27709.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4035 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer. Any "partially finished" or "post-finished" fabrics should first be processed in accordance with the fabric manufacturer's instructions.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test results is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for neckties and scarfs shall conform to the specification requirements in Table 1.

7. Test Methods (see Note 1)

7.1 *Bursting Strength*—Determine the bursting strength, in the standard atmosphere for testing textiles, as directed in Method D 3786 – 79 or Method D 3787 – 79.

NOTE 2—There is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphragm bursting tester. Consequently, these two bursting testers cannot be used interchangeably. In case of controversy, the CRT machine equipped with a bursting attachment method shall prevail.

NOTE 3—The precision of the ball burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm bursting tester method are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the material to be evaluated.

7.2 *Dimensional Change:*

7.2.1 *Pressing and Finishing During Manufacturing*[5]—Mark specimen(s) as directed in Section 4.5 of AATCC Method 135-1978. Press and finish specimen(s) as agreed upon by the purchaser and the seller with respect to time cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135-1978.

7.2.1.1 If no agreement has been made between the purchaser and the seller, press the specimen(s) using a flat-bed steam press according to the cycle in 10.1.4.1 through 10.1.4.5 of Method D 2724 – 79.

7.2.2 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135-1978 or as agreed between the buyer and the seller (Notes 4 and 5).

7.2.2.1 The wash conditions and drying procedure shall be as specified by the seller.

7.2.3 *Drycleaning*—Determine the maximum dimensional change after three drycleanings in accordance with Section 10.1.1 through 10.1.5 of Method D 2724 – 79 (Notes 4 and 5).

7.2.4 *Growth*—Determine the growth of the fabric as directed in Method D 2594 – 72 (1977).

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[5] The development of a standard method has been referred to Subcommittee D13.59 on Fabric Test Methods, General.

NOTE 4—Launderable fabrics are expected to be drycleanable except where all or part of the fabric is not drycleanable and is so labeled. For example, the fabric could contain a functional finish soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. Goods labeled "Drycleanable" are to be drycleaned only.

NOTE 5—Specimens prepared for 7.2.1 may be used for 7.2.2 and 7.2.3 as desired. When this is done the dimensional change due to laundering or drycleaning is calculated using Eq 1. The dimensional change to pressing and finishing is determined on the fabric as it will reach the user. It is not additive to the dimensional change to laundering or drycleaning of the fabric as it will reach the consumer (see 5.1).

$$\text{Percent Dimensional Change} = 100(D_1 - D_2)/D_2 \quad (1)$$

where: D_1 is the measurement after laundering or drycleaning, and D_2 is the measurement after pressing and finishing.

7.3 *Colorfastness*:

7.3.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23-1975.

NOTE 6—Washing conditions shall be the same as those used in 7.2.2.1. Drycleaning conditions shall be the same as those used in 7.2.3.

7.3.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1975. The test conditions shall be as specified by the seller (Note 4).

7.3.3 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132-1979 (Note 4).

7.3.4 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1977 for solid shades and AATCC Method 116-1977 for prints or as agreed between the purchaser and the seller.

7.3.5 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1979.

7.3.6 *Light*—Determine colorfastness to light as directed in AATCC Method 16A-1977 or AATCC Method 16E-1978.

NOTE 7—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine carbon-arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1978 shall prevail.

7.4 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124-1978 after laundering using the wash-and-wear cycle or the normal cycle as agreed between the purchaser and seller, as specified in Section 7.2.2.1 for washable fabrics or as specified in Section 7.2.3 for drycleanable fabrics (see Note 4).

7.4.1 For fabrics not intended for use in durable press garments, determine the fabric smoothness after pressing as specified in Section 5.12 of AATCC Method 96-1975.

7.4.1.1 The fabric smoothness DP (durable press) rating of such fabrics, and the DP rating of drycleaned fabrics, shall have decreased no more than ½ DP rating from that of the fabric before it is laundered or drycleaned.

7.5 *Flammability*—The flammability requirements shall be as agreed between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 Specification Requirements

NOTE—Class for colorfastness and DP rating is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for very severe color change, color transfer, or wrinkle. The numerical rating in Table 1 or a higher numerical rating is acceptable.

Characteristic	Requirements	Section
Bursting strength (load) (ball burst)	50 lbf (222 N)	7.1
Dimensional change:		
Pressing and finishing	2 % max	7.2.1
After five launderings	5 % max	7.2.2
After three drycleanings	3 % max	7.2.3
Growth	3 % max	7.2.4
Colorfastness:		
Burnt gas fumes, 2 cycles:		7.3.1
Shade change, original fabric	Class 4[A] min	
Shade change after one laundering or one drycleaning	Class 4[A] min	
Laundering:		7.3.2
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Drycleaning:		7.3.3
Shade change	Class 4[A] min	
Crocking:		7.3.4
Dry	Class 4[C] min	
Wet	Class 3[C] min	
Perspiration		7.3.5
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Light (40 AATCC FU) (xenon-arc)	Step 4[A] min	7.3.6
Fabric appearance (see 7.4.1.1)	DP 3.5[D] min	7.4
Flammability	pass	7.5

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] For durable press fabrics only.

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Designation: D 4036 - 81

Performance Specification for
WOVEN AND KNIT HOUSEHOLD PILLOWCASE, BED SHEET, AND CRIB SHEET FABRICS[1]

This standard is issued under the fixed designation D 4036; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers woven and knit fabrics to be used in the manufacturing of household pillowcases, bed sheets, and crib sheets.

1.2 This performance specification is not applicable to woven and knit fabrics used for sheet blankets, and to woven and knitted sheet fabrics used for apparel.

1.3 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definition of Terms Relating to Textiles[2]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling Pendulum (Elmendorf) Apparatus[3]

D 1682 Test for Breaking Load and Elongation of Textile Fabrics[3]

D 2262 Test for Tearing Strength of Woven Fabrics by Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Texiles[3]

D 3786 Test for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method[3]

D 3787 Test for Bursting Strength of Knitted Goods. Constant-Rate-of-Traverse (CRT), Ball Burst Test[3]

2.2 *AATCC Methods:*[4]

8-1977 Colorfastness to Crocking: AATCC Crockmeter Method

15-1976 Colorfastness to Perspiration

16A-1977 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E-1978 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

61-1975 Colorfastness to Washing, Domestic and Laundering, Commercial: Accelerated

116-1977 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124-1978 Appearance of Durable Press Fabrics After Repeated Home Laundering

135-1978 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabric

Evaluation Procedure 1 Gray Scale for Color Change

Evaluation Procedure 2 Gray Scale for Staining

Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of ASTM test methods that prevail in this document are referenced in Section 7 on Test Methods.

3. Definitions

3.1 *muslin, n—as applied to bed sheeting*, a plain weave fabric with not fewer than 128 yarns/in.^{2} (645 mm^2).

3.1.1 *Discussion*—The construction shall be approximately balanced, namely neither yarn system shall vary more than 15 % of one-half square count from the other yarn. (128/2) × 0.15 = 10 threads/in. (25 mm). The maximum variation for acceptable balance is 74 × 54 threads/in. (25 mm).

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved Aug. 31, 1981. Published October 1981.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

3.2 *percale, n*—as applied to bed sheeting, a plain weave fabric with not fewer than 180 yarns/in.^{2} (645 mm^2).

3.2.1 *Discussion*—The construction shall be approximately balanced, namely neither yarn system shall vary more than 15 % of one-half the square count from the other yarn. (180/2) × 0.15 = 14 threads/in. (25 mm). The maximum variation for acceptable balance is 104 × 76 threads/in. (25 mm).

3.3 *sheet blanket, n*—a thin blanket of cotton or cotton and synthetic blend having a nap on both sides.

3.4 For definitions of other textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics, the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4036 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the user.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens specified in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is not more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification of Requirements

6.1 The properties of fabrics for woven and knit pillowcases, bedsheets, and crib sheets shall conform to the specification requirements in Table 1.

7. Test Methods (Note 1)

7.1 *Breaking Strength (Load), (Woven Fabrics Only)*—Determine the breaking strength, as directed in the grab test procedure of Method D 1682–64 (1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 12 ± 0.5 in. (305 ± 13 mm)/min.

NOTE 2—If preferred, a constant-rate-of-extension (CRE) tensile testing machine may be used. The crosshead speed should be as agreed between the purchaser and seller. There may be no overall correlation between the results obtained with the CRT and CRE machines. Consequently, these two breaking load testers cannot be used interchangeably. In case of controversy, the CRT method shall prevail.

7.2 *Bursting Strength (Knit Fabrics Only)*—Determine the bursting strength of knit fabrics as directed in Method D 3787 – 80a using an approved type of constant-rate-of-traverse (CRT) machine equipped with a bursting attachment or as directed in Method D 3786 – 80a using an approved type of diaphragm bursting tester as agreed between the purchaser and the seller.

NOTE 3—Care should be taken to subtract the tare diaphragm pressure from the gross pressure to obtain actual bursting strength of fabric when using the diaphragm bursting tester. Calibrate equipment according to manufacturer's instruction before using. Since there is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphragm bursting tester, these two bursting testers cannot be used interchangeably. In case of controversy, the CRT machine equipped with a bursting attachment method shall prevail.

Note 4—The precision of the ball burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm bursting tester method are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the type of material to be evaluated.

7.3 *Tear Strength (Elmendorf) (Woven Fabrics Only)*—Determine the tear strength as directed in Method D 1424 – 63 (1975).

NOTE 5—If preferred, Method D 2262–71 (1976) may be used with existing requirements as given in this standard. There may be no overall correlation between the results obtained by the tongue tear method and the Elmendorf method. Consequently these two tear testers cannot be used interchangeably. In case of controversy, Method D 1424 – 63 (1975) shall prevail.

7.4 *Dimensional Change*—Determine the dimensional change after five launderings as directed in Test III B of AATCC Method 135-1978 unless otherwise agreed between the purchaser and seller.

NOTE 6—Nondurable press items can be flat bed pressed after tumble drying to eliminate wrinkles before measuring.

7.5 *Colorfastness:*

7.5.1 *Laundering*—Determine the colorfastness to laundering as directed in Test IV A of AATCC Method 61-1975 unless otherwise agreed between the purchaser and the seller.

7.5.1.1 If it is determined by testing as directed in 7.5.1 that the fabric is not bleachable, Test III A of AATCC Method 61-1975 is to be used.

NOTE 7—For all bleachable items, Test IV A should be used.

7.5.2 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1977 for solid shades and AATCC Method 116-1977 for prints or as agreed between the purchaser and seller.

7.5.3 *Light*—Determine colorfastness to light as directed in AATCC Method 16A-1977 or AATCC Method 16E-1978.

NOTE 8—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon-arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no known overall correlation between them. In case of controversy, AATCC Method 16E-1978 shall prevail.

7.5.4 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1976.

7.6 *Fabric Appearance*—Determine the appearance of durable press fabric after five launderings as directed in Test III B of AATCC Method 124-1978 unless otherwise agreed between the purchaser and seller.

TABLE 1 Specification Requirements

Characteristics	Requirements			
	Woven	Knit	Crib Sheet	Section
Breaking strength (load) CRT method each direction[E]	50 lbf (222 N) min	. . .	35 lbf (156 N) min	7.1
Bursting strength, ball burst[E]	. . .	50 lbf (222 N) min	. . .	7.2
Tear strength, Elmendorf[E] each direction	1.5 lbf (7 N) min	. . .	1.5 lbf (7 N) min	7.3
Dimensional change:				7.4
Durable press (in each direction)	2 % max	4.0 % max	2 % max	
Nondurable press (nonpreshrunk)				
Length	8 % max	. . .	8 % max	
Width	6.0 % max	. . .	6.0 % max	
Preshrunk (in each direction)	2 % max	. . .	2 % max	
Colorfastness to:[A]				
Laundering:				7.5.1
Alteration in shade	Class 4 min[B]	Class 4 min[B]	Class 4 min[B]	
Staining	Class 3 min[C]	Class 3 min[C]	Class 3 min[C]	
Crocking:				7.5.2
Dry	Class 4 min[D]	Class 4 min[D]	Class 4 min[D]	
Wet	Class 3 min[D]	Class 3 min[D]	Class 3 min[D]	
Light (20 AATCC FU), xenon-arc[E]	Step 4 min[B]	Step 4 min[B]	Step 4 min[B]	7.5.3
Perspiration				7.5.4
Alteration in shade	Class 4 min[B]	Class 4 min[B]	Class 4 min[B]	
Staining	Class 3 min[C]	Class 3 min[C]	Class 3 min[C]	
Fabric appearance	DP 3.0 min	DP 3.0 min	DP 3.0 min	7.6

[A] Class in colorfastness and DP rating is based on a numerical scale of 5.0 for negligible color change, color transfer or wrinkling to 1.0 for very severe color change, color transfer or wrinkling. The numerical rating in Table 1 or higher is acceptable.

[B] AATCC Gray Scale for Color Change.

[C] AATCC Gray Scale for Staining.

[D] AATCC Chromatic Transference Scale.

[E] There is more than one standard method that can be used to measure breaking strength, bursting strength, tear strength and lightfastness. These methods cannot be used interchangeably since there may be no overall correlation between them. See Notes 2, 3, 4, 5, and 8.

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Performance Specification for
WOVEN, KNITTED, OR FLOCKED BEDSPREAD FABRICS[1]

This standard is issued under the fixed designation D 4037; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers the performance requirements for woven, knitted, or flocked fabrics to be used in the manufacturing of bedspreads.

1.2 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]
D 1336 Test for Distortion of Yarn in Woven Fabrics[3]
D 1424 Test for Tear Resistance of Woven Fabrics by Falling Pendulum (Elmendorf) Apparatus[3]
D 1682 Test for Breaking Load and Elongation of Textile Fabrics[3]
D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Tensile Testing Machine[3]
D 2724 Testing Bonded and Laminated Apparel Fabrics[3]
D 2905 Practices for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]
D 3786 Test for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics—Diaphragm Bursting Strength Tester Method[3]
D 3787 Test for Bursting Strength of Knitted Goods—Constant-Rate-of-Traverse (CRT) Ball Burst Test[3]

2.2 *AATCC Methods*:[4]

8-1977 Colorfastness to Crocking: AATCC Crockmeter Method
16A-1977 Colorfastness to Light: Carbon-Arc Lamp Continuous Light
16E-1978 Colorfastness to Light: Water Cooled Xenon-Arc Lamp Continuous Light
23-1975 Colorfastness to Burnt Gas Fumes
61-1975 Colorfastness to Washing Domestic and Laundering, Commercial Accelerated
96-1975 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool
116-1977 Colorfastness to Crocking: Rotary Vertical Crockmeter Method
124-1978 Appearance of Durable Press Fabrics After Repeated Home Launderings
132-1976 Colorfastness to Drycleaning
135-1978 Dimensional Changes in Automatic Home Laundering of Woven or Knit Fabrics
Evaluation Procedure 1 Gray Scale for Color Change
Evaluation Procedure 2 Gray Scale for Staining
Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7 on Test Methods.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Fabric Performance Requirements.

Current edition approved Aug. 31, 1981. Published October 1981.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Available from the American Association of Textile Chemists and Colorists, P. O. Box 12215, Research Triangle Park, N. C. 27709.

3. Terminology

3.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Definitions D 123.

4. Significance and Use

4.1 Upon mutual agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4037 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The significance and uses of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Perform tests on the fabric as it will reach the user.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Recommended Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is not more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of woven, knitted, or flocked bedspread fabrics shall conform to the specification requirements in Table 1.

7. Test Methods

7.1 *Breaking Strength* (*load*) (woven fabrics only)—Determine the breaking strength (load), as directed in the grab test of Method D 1682-64 (1975) using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 305 ± 13 mm (12 ± 0.5 in.)/min.

NOTE 2—If preferred, the use of a constant-rate-of-extension (CRE) tensile testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. However, in case of controversy the CRT method as described in 7.1 shall prevail.

7.2 *Bursting Strength* (knit fabrics only)—Determine the bursting strength of knit fabrics in accordance with Method D 3786-79 using an approved type of diaphragm bursting tester or as directed in D 3787-79 using an approved constant-rate-of-traverse (CRT) machine equipped with a bursting attachment as agreed between the purchaser and the seller.

NOTE 3—Care should be taken to subtract the tare diaphragm pressure from the gross pressure to obtain actual bursting strength of fabric when using the diaphragm bursting tester. Calibrate equipment according to manufacturer's instruction before using. Since there is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphragm bursting tester, these two bursting testers cannot be used interchangeably. In case of controversy, the diaphragm bursting tester (D 3786-79) shall prevail.

NOTE 4—The precision of the ball burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm bursting tester method are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the material to be evaluated.

7.3 *Tear Strength* (woven fabrics only)—Determine tear strength as directed in Method D 1424-63 (1975).

NOTE 5—If preferred, use of Method D 2262-71 (1976) is permitted with existing requirements as given in this standard. However, in case of controversy, Method D 1424-63 (1975) shall prevail.

7.4 *Dimensional Change*:

7.4.1 *Laundering*—Determine the dimensional change after 5 launderings as directed in Test II B of AATCC Method 135-1978 unless otherwise agreed between the purchaser and seller.

NOTE 6—Launderable fabrics are expected normally to be drycleanable, except where all or part of the fabric is not drycleanable and is labeled "Do Not Dryclean." "Dryclean Only" goods are not to be laundered.

NOTE 7—Nondurable press items can be hand pressed as directed in 5.12 of AATCC 96-1975 or flat bed pressed as directed in 10.1.4 and 10.1.5 of D 2724-78 after tumble drying to eliminate wrinkles before measuring.

7.4.2 *Drycleaning*—Determine the dimensional change after three drycleanings as directed in 10.1.1 to 10.1.5 of Method D 2724-78 (Note 6).

7.5 *Fabric Appearance*:

7.5.1 Determine the appearance of durable press fabric after five launderings and dryings as directed in Test II B of AATCC Method 124-1975 unless otherwise agreed between the purchaser and seller.

7.5.2 For nondurable press fabrics, launder as in 7.4.1 and determine fabric smoothness after pressing as directed in 5.12 of AATCC 96-1975 or flat bed pressing as directed in 10.1.4 and 10.1.4.5 of D 2724-78.

7.5.2.1 The fabric smoothness (durable press rating) of such fabrics shall have decreased no more than 0.5 durable press rating from that of the fabric before it was laundered.

7.6 *Retention of Hand, Character, and Appearance*—Fabric tested as directed in 7.4.1 and 7.4.2 shall not change more in hand, character, or appearance than in the limitation set by prior agreement between purchaser and seller.

7.7 *Durability of Back Coating*—A fabric shall exhibit no evidence of cracking or peeling of back coating when subjected to tests in accordance with 7.4.1 and 7.4.2.

7.8 *Colorfastness*:

7.8.1 *Laundering*—Determine the colorfastness to laundering as directed in Test II A of AATCC Method 61-1975 unless otherwise agreed between the purchaser and seller (Note 6).

7.8.1.1 In this test use Multifiber Test Fabric No. 10[5] and evaluate only cotton, polyester and the textile fiber(s) composition of the fabric.

7.8.2 *Drycleaning*—Determine the colorfastness of drycleaning as directed in AATCC Method 132-1976 (Note 6).

7.8.3 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes after 2 cycles on the original fabric as directed in AATCC Method 23-1975. Repeat test for 2 cycles on another specimen after 1 laundering or 1 drycleaning.

NOTE 8—Laundering conditions shall be the same as those in 7.4.1 and drycleaning conditions shall be the same as those in 7.4.2.

7.8.4 *Crocking*—Determine the colorfastness to wet and dry crocking as directed in AATCC Method 8-1977 for solid shades and AATCC Method 116-1977 for prints or as agreed between the purchaser and seller.

7.8.5 *Light*—Determine colorfastness to light as directed in AATCC Method 16A-1974 or AATCC Method 16E-1976.

NOTE 9—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon-arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no known overall correlation between them. In case of controversy, AATCC Method 16E-1978 shall prevail.

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[5] Available from Testfabrics, Inc., P. O. Box 118, Middlesex, N. J. 08846.

TABLE 1 Specification Requirements

NOTE—Class for colorfastness and DP rating is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for very severe color change, color transfer, or wrinkle. The numerical rating in Table 1 or a higher numerical rating is acceptable.

Characteristic	Requirements		Section
	Woven	Knit	
Breaking strength (load)	25 lbf (111 N) min	. . .	7.1
Bursting strength	. . .	35 psi (241 kPa) min	7.2
Tear strength	1.5 lbf (6.7 N) min		7.3
Dimensional change:			
Laundering and drycleaning (each direction):			7.4.1–7.4.2
Tailored type	3.5 % max	5.0 % max	
Throw type	5.0 % max	5.0 % max	
Durable press			7.5–7.5.2.1
Fabric appearance rating	DP 3.5 min	DP 3.5 min	
Retention of hand, character, and appearance	Pass	Pass	7.6
Durability of back coating	Pass	Pass	7.7
Colorfastness to:			
Laundering:			7.8.1
Shade change	Class 4 min^A	Class 4 min^A	
Staining	Class 3 min^B	Class 3 min^B	
Drycleaning:			7.8.2
Shade change	Class 4 min^A	Class 4 min^A	
Burnt gas fumes (two cycles)			
Shade change			7.8.3
Original	Class 4 min^A	Class 4 min^A	
After one laundering or one drycleaning	Class 4 min^A	Class 4 min^A	
Crocking:			7.8.4
Dry	Class 4 min^C	Class 4 min^C	
Wet	Class 3 min^C	Class 3 min^C	
Light (20 AATCC standard fading units)	Step 4 min^A	Step 4 min^A	7.8.5

[A] AATCC Gray Scale for Color Change.
[B] AATCC Gray Scale for Staining.
[C] AATCC Chromatic Transference Scale.

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Designation: D 4038 – 81$^{\epsilon 1}$

Performance Specification for
WOMEN'S AND GIRLS' WOVEN DRESS AND BLOUSE FABRICS[1]

This standard is issued under the fixed designation D 4038; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

[ε1] NOTE—Table 1 was corrected editorially in June 1982.

1. Scope

1.1 This performance specification covers woven women's and girls' dress and blouse fabrics composed of any textile fiber or mixture of textile fibers.

1.2 This performance specification is not applicable to woven fabrics used for interlinings.

1.3 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

1.4 When a fabric requires special treatment, specific methods will be described as they are developed for that material, and such special tests will have precedence over these general requirements.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]
D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[3]
D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[3]
D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[3]
D 2261 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant Rate-of-Extension Tensile Testing Machine)[3]
D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant Rate-of-Traverse Tensile Testing Machine)[3]
D 2724 Testing Bonded and Laminated Apparel Fabrics[3]
D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

2.2 *AATCC Methods*:[4]

8 Colorfastness to Crocking: AATCC Crockmeter Method
15 Colorfastness to Perspiration
16A Colorfastness to Light: Carbon-Arc Lamp, Continuous Light
16E Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light
23 Colorfastness to Burnt Gas Fumes
61 Colorfastness to Washing, Domestic, and Laundering, Commercial Accelerated
96 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool
116 Colorfastness to Crocking: Rotary Vertical, Crockmeter Method
124 Appearance of Durable Press Fabrics after Repeated Home Launderings
132 Colorfastness to Drycleaning
135 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics
Evaluation Procedure No. 1 Gray Scale for Color Change
Evaluation Procedure No. 2 Gray Scale for Staining

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Fabric Performance Requirements.

Current edition Aug. 31, 1981. Published October 1981.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N. C. 27709.

Evaluation Procedure No. 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7 on Test Methods.

3. Definitions

3.1 *sheer*, n—a woven fabric that is transparently thin or diaphanous such as chiffon, batiste, net, organdy, and voile.

3.2 For definitions of other textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Definitions D 123.

4. Significance and Use

4.1 Upon mutual agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4038 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The significance and use of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of woven fabric for women's and girls' dresses and blouses shall conform to the specification requirements in Table 1.

7. Test Methods (see Note 1)

7.1 *Breaking Strength (Load)*—Determine the dry breaking strength (load) in the standard atmosphere for testing textiles, as directed in the grab test procedure of Method D 1682-64 (1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 305 ± 13 mm (12 ± 0.5 in.)/min).

NOTE 2—If preferred, the use of a constant-rate-of-extension (CRE) testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and the CRE machine, consequently, these two breaking load testers cannot be used interchangeably. In case of controversy, the CRT machine shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434-75.

NOTE 3—The precision of Method D 434-75 is being established, and it may not be suitable for fabrics with low yarn counts in terms of ends and picks per inch (see 4.2).

7.3 *Tear Strength*—Determine the tear strength as directed in Method D 2262-71 (1976).

NOTE 4—If preferred, the use of Method D 1424-1975 and D 2261-71 (1976) is permitted with existing requirements as given in this standard. There may be no overall correlation between the results obtained with the tongue tear machines and the Elmendorf machine. Consequently, these three testers cannot be used interchangeably. In case of controversy, Method D 2262-71 (1976) shall prevail.

7.4 *Dimensional Change*:

7.4.1 *Pressing and Finishing During Manufacturing*[5]—Mark the specimen(s) as directed in 4.3.1 of AATCC Method 135-1978. Press the specimen(s) as agreed upon by the buyer and seller with respect to time cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135-1978.

7.4.1.1 If no agreement has been made between the purchaser and the seller, press the specimen(s) using a flat-bed press according to the cycle in 10.1.4.1 through 10.1.4.5 of Method D 2724-79.

7.4.2 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135-1978 or as agreed between the purchaser and the seller.

NOTE 5—Launderable fabrics are expected to be dry-cleanable except where all or part of the fabric is not dry-cleanable and is so labeled. For example, the fabric could contain a functional finish soluble in the solvent, or the fiber could be degraded by the solvent, as would be the case with poly(vinyl chloride) fiber. Goods labeled "dry-cleanable" are to be dry-cleaned only.

7.4.2.1 The wash conditions and drying procedure shall be as specified by the seller.

NOTE 6—Specimens prepared for 7.4.1 may be used for 7.4.2 and 7.4.3 as desired. When this is done, the dimensional change due to laundering or dry-cleaning is calculated using Eq. 1. The dimensional change to pressing and finishing is determined on the fabric as it will reach the user. It is not additive to the dimensional change to laundering or dry cleaning of the fabric as it will reach the consumer (see 5.1).

$$\text{Percent Dimensional Change} = 100\,(D_1 - D_2)/D_2 \qquad (1)$$

where: D_1 is the measurement after laundering or drycleaning, and D_2 is the measurement after pressing and finishing.

7.4.3 *Dry Cleaning*—Determine the maximum dimensional change after 3 dry cleanings in accordance with Sections 10.1.1 to 10.1.5 of Method D 2724-1979.

7.5 *Colorfastness*:

7.5.1 *Laundering*—Determine the colorfastness to laundering as directed in AATCC Method 61-1975. The test conditions shall be as specified by the seller (Note 5).

7.5.2 *Dry Cleaning*—Determine the colorfastness to dry cleaning as directed in AATCC Method 132-1979 (Note 5).

7.5.3 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one dry cleaning as directed in AATCC Method 23-1975.

NOTE 7—Washing conditions shall be the same as those used in 7.4.2.1. Dry cleaning conditions shall be the same as those used in 7.4.3.

7.5.4 *Crocking*—Determine the colorfastness to dry and wet crocking as directed in AATCC Method 8-1977 for solid shades and AATCC Method 116-1977 for prints or as agreed between the purchaser and the seller.

7.5.5 *Perspiration*—Determine the colorfastness to perspiration as directed in AATCC Method 15-1979.

7.5.6 *Light*—Determine the colorfastness to light as directed in AATCC Method 16A-1977 or AATCC Method 16E-1978.

NOTE 9—There is a distinct difference in spectral distribution between the xenon-fading lamp apparatus and the enclosed carbon-arc (not sunshine carbon-arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1978 shall prevail.

7.6 *Fabric Appearance After Repeated Home Launderings*—Determine the fabric appearance as directed in AATCC Method 124-1978 after laundering using the wash-and-wear cycle or the normal cycle as agreed between the purchaser and the seller as specified in 7.4.2.1 for washable fabrics or after dry cleaning as specified in 7.4.3 for dry-cleanable fabrics (see Note 5).

7.6.1 For fabrics not intended for use in durable press products, determine the fabric smoothness after pressing as specified in 5.12 of AATCC Method 96-1975.

7.6.1.1 The fabric smoothness (durable press rating) of such fabrics and the durable press rating of dry-cleaned fabrics shall have decreased no more than ½ durable press rating from that of the fabric before it is laundered or dry-cleaned.

7.7 *Flammability*—The flammability requirements shall be as agreed upon by the purchaser and the seller, except when regulated by applicable Federal mandatory standards.

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[5] The development of a standard method has been referred to Subcommittee D13.59 on Fabric Test Methods, General.

TABLE 1 **Specification Requirements for Women's and Girls' Woven Dress and Blouse Fabrics**

NOTE—Class for colorfastness and DP rating is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for severe color change, color transfer, or wrinkle.

Characteristic	Requirements		Section
	Sheer Fabrics	Nonsheer Fabrics	
Breaking strength (load) (CRT)	15 lbf (67 N), min	25 lbf (111 N) min	7.1
Resistance to yarn slippage, ¼ in. (6 mm) separation	10 lbf (45 N) min	15 lbf (67 N) min†	7.2
Tongue tear strength	1.0 lbf (4.5 N) min	1.5 lbf (6.7 N)	7.3
Dimensional Change:			
After 5 launderings	3.0 % max	3.0 % max	7.4.2
After 3 dry cleanings	2.0 % max	2.0 % max	7.4.3
Pressing	1.0 % max	1.0 % max	7.4.1
Colorfastness to:			
Laundering:			7.5.1
Shade change	Class 4^A min	Class 4^a min	
Staining	Class 3^B min	Class 3^B min	
Dry cleaning:			7.5.2
Shade change	Class 4^A min	Class 4^A min	
Burnt gas fumes	Class 4^A min	Class 4^A min	7.5.3
Alteration in shade: 1 cycle on original and after 1 washing or 1 dry cleaning, or both	Class 4^A min	Class 4^A min	7.5.3
Crocking			7.5.4
Dry	Class 4^C min	Class 4^C min	
Wet	Class 3^C min	Class 3^C min	
Perspiration			7.5.5
Shade change	Class 4^A min	Class 4^A min	
Staining	Class 3^B min	Class 3^B min	
Light (xenon-arc)			7.5.6
20 AATCC fading units	Step 4^A min	Step 4^A min	
Fabric Appearance (see 7.6.1.1)	DP 3.5^D min	DP 3.5^D min	7.6
Flammability	pass	pass	7.7

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] For durable press fabrics only.

† Editorial correction.

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Standard Performance Specification for
MEN'S AND BOYS' WOVEN COVERALL, DUNGAREE, OVERALL, AND SHOP-COAT FABRICS[1]

This standard is issued under the fixed designation D 4109; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers men's and boys' woven coverall, dungaree, overall, and shop-coat fabrics comprised of any textile fiber or mixture of textile fibers.

1.2 These requirements apply to both the length and width directions for those properties where fabric direction is pertinent.

1.3 This performance specification is not applicable to woven fabrics used for interlinings and industrial-protective clothing.

NOTE 1—The specific dated editions of the ASTM and AATCC methods that prevail in this specification are referenced in Section 7.

2. Applicable Documents (Note 1)

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[3]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[3]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[3]

D 2261 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Extension Tensile Testing Machine)[3]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[3]

D 2724 Testing Bonded and Laminated Apparel Fabrics[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

2.2 *AATCC Methods*:[4]

8 Colorfastness to Crocking: AATCC Crockmeter Method

15 Colorfastness to Perspiration

16A Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23 Colorfastness to Burnt Gas Fumes

61 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124 Appearance of Durable Press Fabrics After Repeated Home Launderings

132 Colorfastness to Drycleaning

135 Dimensional Changes in Automatic Home Laundering of Woven or Knit Fabrics

Evaluation Procedure No. 1 Gray Scale for Color Change

Evaluation Procedure No. 2 Gray Scale for Staining

Evaluation Procedure No. 3 AATCC Chromatic Transference Scale

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved March 26, 1982. Published June 1982.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standrads*, Part 32.

[4] Available from American Association of Textile Chemists and Colorists, P. O. Box 12215, Research Triangle Park, N.C. 27709.

3. Terminology

3.1 *Definitions.*

3.1.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC methods and to Definitions D 123.

3.2 *Descriptions of Terms:*

3.2.1 *Type I Apparel*—apparel designed for general heavy work. It may be subjected to breaking and tearing stresses indoors or out.

3.2.2 *Type II Apparel*—apparel designed for light work or leisure activities. It will not be expected to undergo severe physical stresses.

4. Uses and Significance

4.1 Upon agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified upon agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4109 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

5. Sampling

5.1 Tests shall be performed on the fabrics as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable methods.

5.2.1 If there has been no prior agreement and the method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot), when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of woven fabrics for men's and boys' woven coverall, dungaree, overall, and shop-coat fabrics shall conform to the specification requirements in Table 1.

7. Test Methods (see Note 1)

7.1 *Breaking Strength* (*Load*)—Determine the dry-breaking strength (load) as directed in the grab test procedure of Method D 1682 – 64 (1975), using a constant-rate-of-traverse (CRT) tensile-testing machine with the speed of the pulling clamp at 305 ± 13 mm (12 ± ½ in.)/min.

NOTE 2—If preferred, the use of the constant-rate-of-extension (CRE) testing machine is permitted. The crosshead speed should be as agreed upon between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and the CRE machine, consequently, these two breaking-load testers cannot be used interchangeably. In case of controversy, the CRT machine shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434 – 75.

NOTE 3—The precision of Method D 434 – 75 is being established, and it may not be suitable for fabrics with low-yarn counts in terms of ends and picks per inch (see 4.2).

7.3 *Tear Strength*—Determine the tear strength as directed in Method D 2262 – 71 (1976).

NOTE 4—If preferred, the use of Methods D 1424 – 63 (1975) and D 2261 – 71 (1976) is permitted with existing requirements as given in this specification. There may be no overall correlation between the results obtained with the tongue-tear machines and the Elmendorf machine. Consequently, these tear testers cannot be used interchangeably. In case of controversy, Method D 2262 – 71 (1976) shall prevail.

7.4 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124 – 1978 after laundering using the wash-n-wear cycle, or the normal cycle as agreed upon between the purchaser and the seller as specified in 7.6.2 for washable fabrics, or after drycleaning as specified in 7.6.3 for dry-cleanable fabrics (see Note 5).

7.4.1 For fabrics not intended for use in "Durable Press" garments determine the fabric smoothness after pressing as specified in 10.2.5 of Method D 2724 – 79.

7.4.1.1 The fabric smoothness or durable press (DP) rating of such fabrics, and the DP rating of dry-cleaned fabrics, shall have decreased no more than ½ DP rating from that of the fabric before it is laundered or drycleaned.

7.5 *Colorfastness*:

7.5.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes (on the original fabric and after one laundering or one drycleaning) as directed in AATCC Method 23 – 1975 after 2 cycles.

7.5.2 *Laundering*—Determine the colorfastness to laundering as directed in AATCC Method 61 – 1980. The test conditions shall be as agreed upon between the purchaser and seller (Note 5).

7.5.3 *Drycleaning*—Determine the colorfastness to drycleaning as directed in AATCC Method 132 – 1979.

Note 5—Launderable fabrics are expected to be dry-cleanable except where all or part of the fabric is not dry-cleanable and is so labeled. For example, the fabric could contain a functional finish that is soluble in the solvent, or the fiber could be degraded by the solvent, as would be the case with poly(vinyl chloride) fiber. Goods labeled "dry-cleanable" are to be drycleaned only.

7.5.4 *Perspiration*—Determine the colorfastness to perspiration as directed in AATCC Method 15 – 1979.

7.5.5 *Light*—Determine the colorfastness to light as directed in AATCC Methods 16A – 1977 or 16E – 1978.

Note 6—There is a distinct difference in spectral distribution between the xenon-fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E – 1978 shall prevail.

7.5.6 *Crocking*—Determine the colorfastness to crocking as directed in AATCC Method 8 – 1977 for solid shades and AATCC Method 116 – 1977 for prints, or as agreed upon between the purchaser and the seller.

7.6 *Dimensional Change*:

7.6.1 *Pressing and Finishing During Manufacturing*—Mark specimen(s) as directed in 4.4 of AATCC Method 135 – 1978. Press and finish specimen(s) as agreed upon between the purchaser and the seller with respect to time cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135 – 1978 (see Note 5).

7.6.1.1 If no agreement has been made between the purchaser and the seller, press the specimen(s) using a flat-bed steam press and using a cycle as directed in 10.1.4.1 through 10.1.4.5 of Method D 2724 – 79.

7.6.2 *Laundering*—Determine the maximum-dimensional change after five launderings or as agreed upon between the purchaser and the seller as directed in the applicable procedure in AATCC Method 135 – 1978 (Notes 5 and 7).

7.6.2.1 The wash conditions and drying procedure shall be as specified by the seller.

Note 7—Specimens prepared for 7.6.1 may be used for 7.6.2 and 7.6.3 as desired. When this is done, the dimensional change due to laundering or drycleaning is calculated using Eq 1. The dimensional change to pressing is determined on the fabric as it will reach the user. It is not additive to the dimensional change to laundering or drycleaning of the fabric as it will reach the consumer. (See 5.1.)

$$\text{Percent Dimensional Change} = 100\,(D_1 - D_2)/D_2 \qquad (1)$$

where:

D_1 = the measurement after laundering or drycleaning, and

D_2 = the measurement after pressing and finishing.

7.6.3 *Drycleaning*—Determine the maximum-dimensional change after three drycleanings or as agreed upon between the purchaser and the seller as directed in 10.1.1 through 10.1.5 of Method D 2724 – 79.

7.7 *Flammability*—The flammability requirements shall be as agreed upon between the purchaser and the seller, except when regulated by applicable Federal mandatory standards.

TABLE 1 Specification Requirements

NOTE—Class for color change, color transfer, and DP rating is based on a numerical scale of 5 for negligible or no wrinkle, color change, or color transfer to 1 for severe wrinkle, color change, or color transfer.

Characteristics	Requirements		Section
Breaking strength (*load*)(CRT):			7.1
Type I	308 N (70 lbf), min		
Type II	178 N (40 lbf), min		
Yarn slippage:			7.2
Type I	6.3 mm (¼ in.) separation at 133 N (30 lbf), min		
Type II	6.3 mm (¼ in.) separation at 111 N (25 lbf), min		
Tongue-tear strength (CRT):			7.3
Type I	13 N (3.0 lbf), min		
Type II	11 N (2.5 lbf), min		
Fabric Appearance (see 7.4.1.1)	DP 3.5[A], min		7.4
Colorfastness:	Non-Indigo Dyed	Indigo Dyed	
Burnt gas fumes—2 cycles:			
Shade change, original fabric	Class 4[B], min	Class 4[B], min	7.5.1
Shade change, after one laundering or one drycleaning	Class 4[B], min	Class 4[B], min	
Laundering:			
Shade change	Class 4[B], min	Class 2[B], min	7.5.2
Staining	Class 3[C], min	Class 2[C], min	
Drycleaning:			
Shade change	Class 4[B], min	Class 3[B], min	7.5.3
Perspiration:			
Shade change	Class 4[B], min	Class 3[B], min	7.5.4
Staining	Class 3[C], min	Class 3[C], min	
Light (20 AATCC FU) (xenon-arc)	Step 4[B], min	Step 4[B], min	7.5.5
Crocking:			
Dry	Class 4[D], min	Class 3[D], min	7.5.6
Wet	Class 3[D], min	Class 2[D], min	
Dimensional change:			
Pressing and finishing (DP fabrics)	2 % max	2 % max	
Laundering (DP fabrics)	2.5 % max	2.5 % max	7.6.1
Laundering (non-DP fabrics)	3.0 % max	3.0 % max	
Drycleaning	2.5 % max	2.5 % max	7.6.3
Flammability	pass	pass	7.7

[A] For durable press (DP) fabrics only.
[B] AATCC Gray Scale for Color Change.
[C] AATCC Gray Scale for Staining.
[D] AATCC Chromatic Transference Scale.

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Standard Performance Specification for
MEN'S AND BOYS' KNITTED BATHROBE, DRESSING GOWN, AND PAJAMA FABRICS[1]

This standard is issued under the fixed designation D 4110; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers knitted fabrics for men's and boys' bathrobes, dressing gowns, and pajamas.

1.2 These performance requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]
D 2594 Tests for Stretch Properties of Knitted Fabrics Having Low Power[3]
D 2724 Testing Bonded and Laminated Apparel Fabrics[3]
D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]
D 3786 Test for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics—Diaphragm Bursting Strength Tester Method[3]
D 3787 Test for Bursting Strength of Knitted Goods—Constant-Rate-of-Traverse (CRT) Ball Burst Test[3]

2.2 *AATCC Methods*:[4]

8 Colorfastness to Crocking: AATCC Crockmeter Method
15 Colorfastness to Perspiration
16A Colorfastness to Light: Carbon-Arc Lamp, Continuous Light
16E Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light
23 Colorfastness to Burnt Gas Fumes
61 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated
116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method
124 Appearance of Durable Press Fabrics After Repeated Home Launderings
132 Colorfastness to Drycleaning
135 Dimensional Changes in Automatic Home Laundering of Woven or Knit Fabrics
Evaluation Procedure No. 1 Gray Scale for Color Change
Evaluation Procedure No. 2 Gray Scale for Staining
Evaluation Procedure No. 3 AATCC Chromatic Transference Scale.

NOTE 1—The specific dated editions of the ASTM and AATCC methods that prevail in this specification are referenced in Section 7.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon agreement between the purchaser and the seller, knitted fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved March 26, 1982. Published June 1982.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified upon agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4110 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and methods are discussed in the appropriate sections of the specified methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer. Any "partially finished" or "post-finished" fabrics should first be processed as directed in the fabric manufacturer's instructions.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable methods.

5.2.1 If there has been no prior agreement and the method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot), when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of knitted fabrics for bathrobes, dressing gowns, and pajamas shall conform to the specification requirements in Table 1.

7. Test Methods (see Note 1)

7.1 *Bursting Strength*—Determine the bursting strength, in the standard atmosphere for testing textiles, as directed in Methods D 3786 – 79 or D 3787 – 79.

NOTE 2—There is no overall correlation between the results obtained when using the constant-rate-of-traverse (CRT) machine equipped with a bursting attachment and the diaphragm-bursting tester. Consequently, these two bursting testers cannot be used interchangeably. In case of controversy, the CRT machine equipped with a bursting-attachment method shall prevail.

NOTE 3—The precision of the ball-burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm-bursting tester method are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the material to be evaluated.

7.2 *Dimensional Change*:

7.2.1 *Pressing and Finishing During Garment Manufacturing*—Mark specimen(s) as directed in 4.5 of AATCC Method 135 – 1978. Press and finish specimen(s) as agreed upon between the purchaser and the seller with respect to time cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135 – 1978 (see Note 4).

7.2.1.1 If no agreement has been made between the purchaser and the seller, press the specimen(s) using a flat-bed steam press according to the cycle in 10.1.4 through 10.1.4.5 of Method D 2724 – 79.

NOTE 4—No method is available for reproducing on a laboratory level the results of industrial press or finish treatments, or both, used in the manufacture of knitted bathrobes, dressing gowns, and pajamas.[5]

7.2.2 *Laundering*—Determine the maximum-dimensional change after five launderings or as agreed upon between the purchaser and the seller as directed in the applicable procedure in AATCC Method 135 – 1978 (Notes 5 and 6).

7.2.2.1 The wash conditions and drying procedure shall be as specified by the seller.

7.2.3 *Drycleaning*—Determine the maximum-dimensional change after three drycleanings

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[5] The development of a method has been referred to Subcommittee D13.59 on Fabric Test Methods, General.

ings or as agreed upon between the purchaser and the seller in accordance with 10.1.1 through 10.1.5 of Method D 2724 – 79 (Notes 5 and 6).

7.2.4 *Growth*—Determine the growth of the fabric as directed in Method D 2594 – 72 (1977).

NOTE 5—Launderable fabrics are expected to be dry-cleanable except where all or part of the fabric is not dry-cleanable and is so labeled. For example, the fabric could contain a functional finish that is soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. "Dry-cleanable" goods are to be dry-cleaned only.

NOTE 6—Specimens prepared for 7.2.1 may be used for 7.2.2 and 7.2.3 as desired. When this is done, the dimensional change due to laundering or drycleaning is calculated using Eq 1. The dimensional change to pressing and finishing is determined on the fabric as it will reach the user. It is not additive to the dimensional change to laundering or drycleaning of the fabric as it will reach the consumer (see 5.1).

$$\text{Percent Dimensional Change} = 100\,(D_1 - D_2)/D_2 \quad (1)$$

where:

D_1 = the measurement after laundering or drycleaning, and

D_2 = the measurement after pressing and finishing.

7.3 *Colorfastness*:

7.3.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23 – 1975 after 2 cycles.

NOTE 7—Washing conditions shall be the same as those used in 7.2.2.1. Drycleaning conditions shall be the same as those used in 7.2.3.

7.3.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61 – 1980. The test conditions shall be as specified by the seller (Note 5).

7.3.3 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132 – 1979 (Note 5).

7.3.4 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8 – 1977 for solid shades and AATCC Method 116 – 1977 for prints, or as agreed upon between the purchaser and the seller.

7.3.5 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15 – 1979.

7.3.6 *Light*—Determine colorfastness to light as directed in AATCC Methods 16A – 1977 or 16E – 1978.

NOTE 8—There is a distinct difference in spectral distribution between the xenon-fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E – 1978 shall prevail.

7.4 *Fabric Appearance*—Determine the fabric appearance as direced in AATCC Method 124 – 1978 after laundering using the wash-and-wear cycle or the normal cycle as agreed upon between the purchaser and seller, as specified in 7.2.2.1 for washable fabrics or as specified in 7.2.3 for dry-cleanable fabrics (see Note 5).

7.4.1 For fabrics not intended for use in durable-press garments, determine the fabric smoothness after pressing as specified in 10.2.5 of Method D 2724 – 79.

7.4.1.1 The fabric smoothness or durable press (DP) rating of such fabrics, and the DP rating of dry-cleaned fabrics, shall have decreased no more than ½ DP rating from that of the fabric before it is laundered or drycleaned.

7.5 *Flammability*—The flammability requirements shall be as agreed upon between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 Specification Requirements

NOTE—Class for color change, color transfer, and DP rating is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for very severe color change, color transfer, or wrinkle. The numerical rating in Table 1 or a higher numerical rating is acceptable.

Characteristic	Requirements	Section
Bursting strength (load)(ball burst)	222 N (50 lbf), min	7.1
Dimensional change:		
Pressing and finishing	2 % max	7.2.1
After five launderings	5 % max	7.2.2
After three drycleanings	2 % max	7.2.3
Growth	3 % max	7.2.4
Colorfastness:		
Burnt gas fumes—2 cycles:		7.3.1
Shade change, original fabric	Class 4[A] min	
Shade change after one laundering or one drycleaning	Class 4[A] min	
Laundering:		7.3.2
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Drycleaning:		7.3.3
Shade change	Class 4[A] min	
Crocking:		7.3.4
Wet	Class 4[C] min	
Dry	Class 3[C] min	
Perspiration:		7.3.5
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Light (20 AATCC FU) (xenon-arc)	Step 4[A] min	7.3.6
Fabric appearance (see 7.4.1.1)	DP 3.5[D] min	7.4
Flammability	pass	7.5

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] For durable press fabrics only.

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Designation: D 4111 - 82

Standard Performance Specification for
WOVEN NAPERY AND TABLECLOTH FABRICS: HOUSEHOLD AND INSTITUTIONAL[1]

This standard is issued under the fixed designation D 4111; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers woven napery and tablecloth fabrics (household and institutional) composed of any textile fiber or mixture of textile fibers.

1.2 These requirements apply to both the length and width directions for those properties where fabric direction is pertinent.

NOTE 1—The specific dated editions of the ASTM and AATCC methods that prevail in this specification are referenced in Section 7.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]

D 1336 Test for Distortion of Yarn in Woven Fabrics[3]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[3]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[3]

D 2261 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Extension Tensile Testing Machine)[3]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[3]

D 2724 Testing Bonded and Laminated Apparel Fabrics[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

2.2 *AATCC Methods*:[4]

8 Colorfastness to Crocking: AATCC Crockmeter Method

16A Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23 Colorfastness to Burnt Gas Fumes

61 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

92 Chlorine, Retained, Tensile Loss: Single Sample Method

96 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool

116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

130 Soil Release: Oily Stain Release Method

135 Dimensional Changes in Automatic Home Laundering of Woven or Knit Fabrics

Evaluation Procedure No. 1 Gray Scale for Color Change

Evaluation Procedure No. 2 Gray Scale for Staining

Evaluation Procedure No. 3 AATCC Chromatic Transference Scale.

3. Definitions

3.1 For definitions of textile terms used in this specification refer to the individual ASTM and AATCC methods and to Definitions D 123.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved June 25, 1982. Published September 1982.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

4. Uses and Significance

4.1 Upon agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified upon agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4111 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and methods are discussed in the appropriate sections of the specified methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable methods.

5.2.1 If there has been no prior agreement and the method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot), when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of woven fabrics for woven napery and tablecloth fabrics for household and institutional use shall conform to the specification requirements in Table 1.

7. Test Methods (see Note 1)

7.1 *Breaking Strength (Load)*—Determine the dry-breaking strength (load) as directed in the grab test procedure of Method D 1682 – 64 (1975), using a constant-rate-of-traverse (CRT) tensile-testing machine with the speed of the pulling clamp at 305 ± 13 mm (12 ± ½ in.)/min.

NOTE 2—If preferred, the use of a constant-rate-of-extension (CRE) testing machine is permitted. The crosshead speed should be as agreed upon between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and the CRE machine, consequently, these two breaking-load testers cannot be used interchangeably. In case of controversy, the CRT machine shall prevail.

7.2 *Yarn Distortion*—Determine the yarn distortion as directed in Method D 1336 – 72 (1977).

7.3 *Tear Strength*—Determine the tear strength as directed in Method D 2262 – 71 (1976).

NOTE 3—If preferred, the use of Methods D 1424 – 63 (1975) and D 2261 – 71 (1976) is permitted with existing requirements as given in this specification. There may be no overall correlation between the results obtained with the tongue-tear machines and the Elmendorf machine. Consequently, these tear testers cannot be used interchangeably. In case of controversy, Method D 2262 – 71 (1976) shall prevail.

7.4 *Colorfastness*:

7.4.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes (on the original fabric and after one laundering or one drycleaning) as directed in AATCC Method 23 – 1975 after 1 cycle.

7.4.2 *Light*—Determine the colorfastness to light as directed in AATCC Methods 16A – 1977 or 16E – 1978.

NOTE 4—There is a distinct difference in spectral distribution between the xenon-fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E – 1978 shall prevail.

7.4.3 *Crocking*—Determine the colorfastness to crocking as directed in AATCC Method 8 – 1977 for solid shades and AATCC Method

116 - 1977 for prints, or as agreed upon between the purchaser and the seller.

7.4.4 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61 - 1980. The test conditions shall be as specified by the seller.

7.5 *Dimensional Change*—Determine the maximum-dimensional change after 5 launderings, or as agreed upon between the purchaser and the seller, as directed in the applicable procedure in AATCC Method 96 - 1980 for institutional fabrics, or as directed in the applicable procedure in AATCC Method 135 - 1978 for household fabrics.

7.5.1 The wash conditions and drying procedure shall be as specified by the seller.

7.6 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124 - 1975 after laundering using the wash-n-wear cycle, or the normal cycle as agreed upon between the purchaser and the seller as specified in 7.5.1.

7.6.1 For fabrics not intended for use in "Durable Press" products determine the fabric smoothness after pressing as specified in 10.2.5 of Method D 2724 - 79.

7.6.1.1 The fabric smoothness or durable press (DP) rating of such fabrics, and the DP rating of dry-cleaned fabrics, shall have decreased no more than ½ DP rating from that of the fabric before it is laundered or dry-cleaned.

7.7 *Chlorine Retention*—Determine the potential damage caused by retained chlorine as directed in AATCC Method 92 - 1980.

7.7.1 Make breaking-strength (load) tests, after scorching as specified in 6.3 of AATCC Method 92 - 1980, as directed in 7.1.

7.7.1.1 The breaking-strength (load) of fabrics treated as in 7.7 shall have decreased no more than 25 % from that of the original fabric, and shall not show noticeable scorching.

7.8 *Absorptive Capacity*—No acceptable method is available for the determination of the absorptive capacity of fabrics for napery and tablecloths.[5]

7.9 *Retention of Hand, Character, and Appearance*—Fabric tested as specified in 7.5.1 shall not change more in hand, character, or appearance than in the limitation set upon prior agreement between the purchaser and the seller.

7.10 *Soil Release*—Determine the soil release properties after 5 launderings as directed in the applicable procedure in AATCC Method 130 - 1977.

7.10.1 Selection of the staining agents shall be as agreed upon between the purchaser and the seller.

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[5] The development of a method has been referred to Subcommittee D13.59 on Fabric Test Methods, General.

TABLE 1 Specification Requirements

NOTE—Class for color change, color transfer, and DP rating is based on a numerical scale of 5 for negligible or no wrinkle, color change, or color transfer to 1 for severe wrinkle, color change, or color transfer.

Characteristic	Requirements	Section
Breaking strength (load) (CRT):		7.1
Household	133 N (30 lbf), min	
Institutional	242 N (55 lbf), min	
Yarn distortion	1 mm (0.05 in.), max	7.2
Tongue-tear strength:		7.3
Household	9 N (2 lbf), min	
Institutional	13 N (3 lbf), min	
Colorfastness:		
Burnt gas fumes—1 cycle:		
Shade change, original fabric	Class 4[B], min	7.4.1
Shade change, after one laundering	Class 4[B], min	
Light (20 AATCC FU) (xenon-arc)	Step 4[B], min	7.4.2
Crocking:		7.4.3
Dry	Class 4[D], min	
Wet	Class 3[D], min	
Laundering:		7.4.4
Shade change	Class 4[B], min	
Staining	Class 3[C], min	
Dimensional change	5 %, max	7.5
Fabric appearance (see 7.6.1.1)	DP 3.5[A], min	7.6
Chlorine retention	see 7.7.1.1	7.7
Retention of hand, character, and appearance	see 7.9	7.9
Soil release	Class 4, min	7.10

[A] For durable press (DP) fabrics only.

[B] AATCC Gray Scale for Color Change.

[C] AATCC Gray Scale for Staining.

[D] AATCC Chromatic Transference Scale.

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Standard Performance Specification for
WOVEN UMBRELLA FABRICS[1]

This standard is issued under the fixed designation D 4112; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers woven umbrella fabrics composed of any textile fiber or mixture of textile fibers.

1.2 These requirements apply to both the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[3]

D 1284 Test for Relaxation and Consolidation Dimensional Changes of Stabilized Knit Wool Fabrics[3]

D 1336 Test for Distortion of Yarn in Woven Fabrics[3]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[3]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[3]

D 2261 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Extension Tensile Testing Machine)[3]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

NOTE 1—The specific dated editions of the ASTM and AATCC methods that prevail in this specification are referenced in Section 7.

2.2 *AATCC Methods*:[4]

8 Colorfastness to Crocking: AATCC Crockmeter Method

16A Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

22 Water Repellency: Spray Test

23 Colorfastness to Burnt Gas Fumes

35 Water Resistance: Rain Test

109 Colorfastness to Ozone in the Atmosphere Under Low Humidities

116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

129 Colorfastness to Ozone in the Atmosphere Under High Humidities

Evaluation Procedure No. 1 Gray Scale for Color Change

Evaluation Procedure No. 2 Gray Scale for Staining

Evaluation Procedure No. 3 AATCC Chromatic Transference Scale

3. Definitions

3.1 For definitions of textile terms used in this specification refer to the individual ASTM and AATCC methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved March 26, 1982. Published June 1982.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified upon agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4112 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and methods are discussed in the appropriate sections of the specified methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable methods.

5.2.1 If there has been no prior agreement and the method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot), when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of woven umbrella fabrics shall conform to the specification requirements in Table 1.

7. Test Methods (see Note 1)

7.1 *Breaking Strength (Load)*—Determine the dry and wet breaking strength (load) as directed in the grab test procedure of Method D 1682 – 64 (1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling clamp at 305 ± 13 mm (12 ± ½ in.)/min.

NOTE 2—If preferred, the use of a constant-rate-of-extension (CRE) testing machine is permitted. The crosshead speed should be as agreed upon between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and the CRE machine. Consequently, these two breaking-load testers cannot be used interchangeably. In case of controversy, the CRT machine shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434 – 75.

NOTE 3—The precision of Method D 434 – 75 is being established, and it may not be suitable for fabrics with low-yarn counts in terms of ends and picks per inch (see 4.2).

7.3 *Yarn Distortion*—Determine the yarn distortion as directed in Method D 1336 – 72 (1977).

7.4 *Tear Strength*—Determine the tear strength as directed in Method D 2262 – 71 (1976).

NOTE 4—If preferred, the use of Methods D 1424 – 63 (1975) and D 2261 – 71 (1976) is permitted with existing requirements as given in this specification. There may be no overall correlation between the results obtained with the tongue-tear machines and the Elmendorf machine. Consequently, these tear testers cannot be used interchangeably. In case of controversy, Method D 2262 – 71 (1976) shall prevail.

7.5 *Colorfastness*:

7.5.1 *Gas*—Determine the colorfastness to Burnt Gas Fumes (on the original fabric and after one laundering) as directed in AATCC Method 23 – 1975 after 1 cycle.

7.5.2 *Light*—Determine the colorfastness to light as directed in AATCC Methods 16A – 1977 or 16E – 1978.

NOTE 5—There is a distinct difference in spectral distribution between the xenon-fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E – 1978 shall prevail.

7.5.3 *Crocking*—Determine the colorfastness to crocking as directed in AATCC Method 8 – 1977 for solid shades and AATCC Method 116 – 1977 for prints, or as agreed upon between the purchaser and the seller.

7.5.4 *Ozone*—Determine the colorfastness to ozone as directed in AATCC Method 129 – 1975.

7.6 *Dimensional Change*—Determine the maximum-dimensional change as directed in Sections 10 and 11 of Method D 1284 – 76.

7.7 *Water Resistance* (*Rain Test*)—Determine the water resistance (rain test) on the original fabric and after laundering as in 7.5 as directed in AATCC Method 35 – 1980.

7.8 *Resistance to Wetting* (*Spray Test*)—Determine the resistance to wetting (spray test) on the original fabric and after laundering as in 7.5 as directed in AATCC Method 22 – 1980.

7.9 *Flammability*—The flammability requirements shall be as agreed upon between the purchaser and the seller, except when regulated by applicable Government standards.

TABLE 1 **Specification Requirements**

NOTE—Class for color change and color transfer is based on a numerical scale of 5 for negligible or no color change or color transfer to 1 for severe color change or color transfer.

Characteristic	Requirements	Section
Breaking strength (*load*) (CRT):		7.1
Dry	154 N (35 lbf), min	
Wet	89 N (20 lbf), min	
Yarn slippage	6-mm (¼-in.) separation at 67 N (15 lbf), min	7.2
Yarn distortion:		7.3
Satins	2.5 mm (0.10 in.), max	
All other	1 mm (0.05 in.), max	
Tongue-tear strength	22 N (5 lbf), min	7.4
Colorfastness:		
Burnt gas fumes—1 cycle:		
Shade change, original fabric	Class 4[A], min	7.5.1
Shade change, after laundering	Class 4[A], min	
Light (20 AATCC FU) (xenon-arc)	Step 4[A], min	7.5.2
Crocking:		7.5.3
Dry	Class 4[B], min	
Wet	Class 4[B], min	
Ozone—1 cycle	Class 4[A], min	7.5.4
Dimensional change	3 %, max	7.6
Water resistance:		7.7
Categories based on minimum time for 1-g weight increase at head pressure of:		
2 ft (600 mm)	30 s, shower	
2 ft (600 mm)	2 minutes, rain	
3 ft (915 mm)	5 minutes, storm	
Water repellency:		7.8
Smooth-textured fabrics:		
Original	90 min	
After laundering	70 min	
Rough-textured fabrics:		
Original	80 min	
After laundering	70 min	
Flammability	pass	7.9

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Designation: D 4113 - 82

Standard Performance Specification for WOVEN SLIPCOVER FABRICS[1]

This standard is issued under the fixed designation D 4113; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers woven slipcover fabrics composed of any textile fiber or mixture of textile fibers.

1.2 These requirements apply to both the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]
D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[3]
D 1336 Test for Distortion of Yarn in Woven Fabrics[3]
D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[3]
D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[3]
D 2261 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Extension Tensile Testing Machine)[3]
D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[3]
D 2724 Testing Bonded and Laminated Apparel Fabrics[3]
D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

2.2 *AATCC Methods*[4]:

8 Colorfastness to Crocking: AATCC Crockmeter Method
15 Colorfastness to Perspiration
16A Colorfastness to Light: Carbon-Arc Lamp, Continuous Light
16E Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light
23 Colorfastness to Burnt Gas Fumes
61 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated
116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method
124 Appearance of Durable Press Fabrics after Repeated Home Launderings
129 Colorfastness to Ozone in the Atmosphere Under High Humidities
132 Colorfastness to Drycleaning
135 Dimensional Changes in Automatic Home Laundering of Woven or Knit Fabrics
Evaluation Procedure No. 1 Gray Scale for Color Change
Evaluation Procedure No. 2 Gray Scale for Staining
Evaluation Procedure No. 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM and AATCC methods that prevail in this specification are referenced in Section 7.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to Definitions D 123 and the Technical Manual of the American Association of Textile Chemists and Colorists.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved March 26, 1982. Published June 1982.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

4. Uses and Significance

4.1 Upon agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified upon agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4113 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and methods are discussed in the appropriate sections of the specified methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable methods.

5.2.1 If there have been no prior agreements and the method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot), when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of flat-woven slipcover fabrics shall conform to the specification requirements in Table 1.

7. Test Methods (see Note 1)

7.1 *Breaking Strength (Load)*—Determine the dry-breaking strength (load), in the standard atmosphere for testing textiles, as directed in the grab test procedure of Method D 1682-64(1975), using a constant-rate-of-traverse (CRT) tensile-testing machine with the speed of the pulling jaw at 305 ± 13 mm (12± 0.5 in.)/min.

Note 2—If preferred, the use of a constant-rate-of-extension (CRE) tensile-testing machine is permitted. The crosshead speed should be as agreed upon between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and with the CRE machine. Consequently, these two breaking-load testers cannot be used interchangeably. In case of controversy, the CRT method shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434-75.

Note 3—The precision of Method D 434-75 is being established, and it may not be suitable for fabrics with low-yarn counts in terms of ends and picks per inch (see 4.2).

7.3 *Tongue-Tear Strength*—Determine the tongue-tear strength as directed in Method D 2262-71(1976).

Note 4—If preferred, the use of Methods D 1424-63(1975) or D 2261-71(1976) is permitted with existing requirements as given in this specification. There may be no overall correlation between the results obtained with the tongue-tear machines and with the Elmendorf machine. Consequently, these three tear testers cannot be used interchangeably. In case of controversy, Method D 2262-71(1976) shall prevail.

7.4 *Yarn Distortion*—Determine the yarn distortion as directed in Method D 1336-72(1977).

7.5 *Dimensional Change*:

7.5.1 *Laundering*—Determine the maximum-dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135-1978 or as agreed upon between the purchaser and the seller (Note 5).

7.5.1.1 The wash conditions and drying procedure shall be as specified by the seller.

7.5.2 *Drycleaning*—Determine the maximum-dimensional change after three drycleanings

ings as directed in 10.1.1 through 10.1.5 of Method D 2724-79 or as agreed upon between the purchaser and the seller (Note 5).

NOTE 5—Launderable fabrics are expected to be dry-cleanable except where all or part of the fabric is not dry-cleanable and is so labeled. For example, the fabric could contain a functional finish that is soluble in the solvent, or the fiber could be degraded by the solvent, as would be the case with poly(vinyl chloride) fiber. "Dry-cleanable" goods are to be drycleaned only.

7.6 *Colorfastness*:

7.6.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23-1975 after 1 cycle.

NOTE 6—Washing conditions shall be the same as those used in 7.5.1.1. Drycleaning conditions shall be the same as those used in 7.5.2.

7.6.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1980. The test conditions shall be as specified by the seller (Note 5).

7.6.3 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132-1979 (Note 5).

7.6.4 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1979 for solid shades and AATCC Method 116-1979 for prints, or as agreed upon between the purchaser and the seller.

7.6.5 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1979.

7.6.6 *Light*—Determine colorfastness to light as directed in AATCC Methods 16A-1977 or 16E-1978.

NOTE 7—There is a distinct difference in spectral distribution between the xenon-fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1978 shall prevail.

7.6.7 *Ozone*—Determine the colorfastness to ozone after two cycles as directed in AATCC Method 129-1975.

7.7 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124-1978 after laundering using the wash-and-wear cycle or the normal cycle as agreed upon between the purchaser and the seller as specified in 7.5.1.1 for washable fabrics or after drycleaning as specified in 7.5.2 for dry-cleanable fabrics (see Note 5).

7.7.1 For fabrics not intended for use in durable press determine the fabric smoothness after pressing as specified in 10.2.3 of Method D 2724-79.

7.7.1.1 The fabric smoothness or durable press (DP) rating of such fabrics, and the DP rating of dry-cleaned fabrics, shall have decreased no more than ½ rating from that of the fabric before it is laundered or drycleaned.

7.8 *Flammability*—The flammability requirements shall be as agreed upon between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 **Specification Requirements**

NOTE—Class for color change, color transfer and DP rating is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for severe color change, color transfer, or wrinkle.

Characteristic	Requirements	Section
Breaking strength (load)(CRT)	220 N (50 lbf) min	7.1
Yarn slippage	6 mm (¼ in.) separation at 67 N (15 lbf), min	7.2
Tongue-tear strength	13 N (3.0 lbf) min	7.3
Yarn distortion	2.5 mm (0.10 in), max at 9 N (2 lbf) load	7.4
Dimensional change:		
Laundering	2.5 %, max	7.5.1
Drycleaning	2.5 %, max	7.5.2
Colorfastness:		
Burnt gas fumes—1 cycle:		7.6.1
Shade change after one laundering or one drycleaning	Class 4[A], min	
Laundering:		7.6.2
Shade change	Class 4[A], min	
Staining	Class 3[B], min	
Drycleaning:		7.6.3
Shade change	Class 4[A], min	
Crocking:		7.6.4
Dry	Class 4[C], min	
Wet	Class 3[C], min	
Perspiration:		7.6.5
Shade change	Class 4[A], min	
Staining	Class 3[B], min	
Light (40 AATCC FU) (xenon-arc)	Step 4[A], min	7.6.6
Ozone	Class 4, min	7.6.7
Fabric appearance (see 7.7.1.1)	DP 3.5[D], min	7.7
Flammability:	pass	7.8

[A] AATCC Gray Scale for Color Change.
[B] AATCC Gray Scale for Staining.
[C] AATCC Chromatic Transference Scale.
[D] For durable press fabrics only.

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Standard Performance Specification for
WOVEN FLAT LINING FABRICS FOR WOMEN'S AND GIRLS' APPAREL[1]

This standard is issued under the fixed designation D 4114; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers woven flat lining fabrics composed of any textile fiber or mixture of textile fibers for women's and girls' apparel.

1.2 This performance specification is not applicable to woven pile, woven fusible, fire-bonded fusible, sliver-knit pile, and sheepskin lining fabrics.

1.3 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[3]

D 1336 Test for Distortion of Yarn in Woven Fabrics[3]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[3]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[3]

D 2261 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Extension Tensile Testing Machine)[3]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[3]

D 2724 Testing Bonded and Laminated Apparel Fabrics[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

2.2 *AATCC Methods*[4]:

8 Colorfastness to Crocking: AATCC Crockmeter Method

15 Colorfastness to Perspiration

16A Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23 Colorfastness to Burnt Gas Fumes

61 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124 Appearance of Durable Press Fabrics after Repeated Home Launderings

132 Colorfastness to Drycleaning

135 Dimensional Changes in Automatic Home Laundering of Woven or Knit Fabrics

Evaluation Procedure No. 1 Gray Scale for Color Change

Evaluation Procedure No. 2 Gray Scale for Staining

Evaluation Procedure No. 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved March 26, 1982. Published June 1982.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

and AATCC methods that prevail in this specification are referenced in Section 7.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified upon agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4114 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and methods are discussed in the appropriate sections of the specified methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable methods.

5.2.1 If there has been no prior agreement and the method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot), when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of flat-woven lining fabrics for women's and girls' apparel shall conform to the specification requirements in Table 1.

7. Test Methods (See Note 1)

7.1 *Breaking Strength (Load)*—Determine the dry-breaking strength (load), in the standard atmosphere for testing textiles, as directed in the grab test procedure of Method D 1682-64(1975), using a constant-rate-of-traverse (CRT) tensile-testing machine with the speed of the pulling jaw at (305 ± 13 mm) 12 ± 0.5 in./min.

NOTE 2—If preferred, the use of a constant-rate-of-extension (CRE) tensile-testing machine is permitted. The crosshead speed should be as agreed upon between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and with the CRE machine. Consequently, these two breaking-load testers cannot be used interchangeably. In case of controversy, the CRT method shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434-75.

NOTE 3—The precision of Method D 434-75 is being established, and it may not be suitable for fabrics with a low number of warp (ends) and filling (picks) counts (see 4.2).

7.3 *Tongue-Tear Strength*—Determine the tongue-tear strength as directed in Method D 2262-71(1976).

NOTE 4—If preferred, the use of Methods D 1424-63(1975) and D 2261-71(1976) is permitted with existing requirements as given in this specification. There may be no overall correlation between the results obtained with the tongue-tear machines and with the Elmendorf machine. Consequently, these three tear testers cannot be used interchangeably. In case of controversy, Method D 2262-71(1976) shall prevail.

7.4 *Yarn Distortion*—Determine the yarn distortion as directed in Method D 1336-72(1977).

7.5 *Dimensional Change*:

7.5.1 *Laundering*—Determine the maximum-dimensional change after five launderings, or as agreed upon between the purchaser and the seller, as directed in the applicable procedure in AATCC Method 135-1978 (Note 5).

7.5.1.1 The wash conditions and drying procedures shall be as specified by the seller.

7.5.2 *Drycleaning*—Determine the maximum-dimensional changes after three drycleanings, or as agreed upon between the purchaser and the seller, as directed in 10.1.1 through 10.1.5 of Method D 2724-79.

Note 5—Launderable fabrics are expected to be dry-cleanable except where all or part of the fabric is not dry-cleanable and is so labeled. For example, the fabric could contain a functional finish that is soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. "Dry-cleanable" goods are to be drycleaned only.

7.6 *Colorfastness*:

7.6.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23-1975 after 2 cycles.

Note 6—Washing conditions shall be the same as those used in 7.5.1.1. Drycleaning conditions shall be the same as those used in 7.5.2.

7.6.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1980. The test conditions shall be as specified by the seller (Note 5).

7.6.3 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132-1979 (Note 5).

7.6.4 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1977 for solid shades and AATCC Method 116-1977 for prints, or as agreed upon between the purchaser and the seller.

7.6.5 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1979.

7.6.6 *Light*—Determine colorfastness to light as directed in AATCC Methods 16A-1977 or 16E-1978.

Note 7—There is a distinct difference in spectral distribution between the xenon-fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1978 shall prevail.

7.7 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124-1978 after laundering using the wash-and-wear cycle or the normal cycle as agreed upon between the purchaser and the seller as specified in 7.5.1.1 for washable fabrics or after drycleaning as specified in 7.5.2 for dry-cleanable fabrics (see Note 5).

7.7.1 For fabrics not intended for use in durable press garments determine the fabric smoothness after pressing as specified in 10.2.5 of Method D 2724-79.

7.7.1.1 The fabric smoothness or durable press (DP) rating of such fabrics, and the DP rating of dry-cleaned fabrics, shall have decreased no more than ½ rating from that of the fabric before it is laundered or drycleaned.

7.8 *Flammability*—The flammability requirements shall be as agreed upon between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 Specification Requirements[E]

NOTE—Class for color change, color transfer, and DP rating is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for severe color change, color transfer, or wrinkle.

Characteristic	Requirements	Section
Breaking strength (load)(CRT)	111 N (25 lbf), min	7.1
Yarn slippage	6.3 mm (¼ in.) separation at 67 N (15 lbf), min	7.2
Tongue-tear strength	6.7 N (1.5 lbf), min	7.3
Yarn distortion		7.4
Satins	2.5 mm (0.10 in.), max	7.4
All other	1 mm (0.05 in.), max	
Dimensional change:		
After five launderings	3 %, max	7.5.1
After three drycleanings	2 %, max	7.5.2
Colorfastness:		
Burnt gas fumes—2 cycles:		7.6.1
Shade change, original fabric	Class 4[A], min	
Shade change after one laundering or one drycleaning	Class 4[A], min	
Laundering:		7.6.2
Shade change	Class 4[A], min	
Staining	Class 3[B], min	
Drycleaning:		7.6.3
Shade change	Class 4[A], min	
Crocking:		7.6.4
Dry	Class 4[C], min	
Wet	Class 3[C], min	
Perspiration:		7.6.5
Shade change	Class 4[A], min	
Staining	Class 3[B], min	
Light (10 AATCC FU)(xenon-arc)	Step 4[A], min	7.6.6
Fabric appearance (see 7.7.1.1)	DP 3.5[D], min	7.7
Flammability	pass	7.8

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] For durable press fabrics only.

[E] There is more than one method that can be used to measure breaking strength (load), tear strength and lightfastness. These methods cannot be used interchangeably since there may be no overall correlation between them (see Notes 2, 4, and 7).

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Standard Performance Specification for
WOMEN'S AND GIRLS' KNITTED AND WOVEN DRESS GLOVE FABRICS[1]

This standard is issued under the fixed designation D 4115; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers women's and girls' knitted and woven-dress glove fabrics composed of any fiber or mixture of textile fibers.

1.2 This performance specification is not applicable to fabrics used for interlinings and industrial-protective clothing.

1.3 These requirements apply to the length and width directions for those properties where each fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[3]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[3]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[3]

D 2261 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Extension Tensile Testing Machine)[3]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

D 3786 Test for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics—Diaphragm Bursting Strength Tester Method[3]

D 3787 Test for Bursting Strength of Knitted Goods—Constant-Rate-of-Traverse (CRT) Ball Burst Test[3]

NOTE 1—The specific dated edition of ASTM and AATCC methods that prevail in this specification are referenced in Section 7 on Test Methods.

2.2 *AATCC Methods*[4]:

8 Colorfastness to Crocking: AATCC Crockmeter Method

16A Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23 Colorfastness to Burnt Gas Fumes

61 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124 Appearance of Durable Press Fabrics after Repeated Home Launderings

132 Colorfastness to Drycleaning

135 Dimensional Changes in Automatic Home Laundering of Woven or Knit Fabrics

Evaluation Procedure No. 1 Gray Scale for Color Change

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved March 26, 1982. Published June 1982.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

Evaluation Procedure No. 2 Gray Scale for Staining

Evaluation Procedure No. 3 AATCC Chromatic Transference Scale.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified upon agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that. "This fabric meets ASTM Specification D 4115 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and methods are discussed in the appropriate sections of the specified methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable methods.

5.2.1 If there has been no prior agreement and the method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot), when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of knitted and woven fabrics for women's and girls' dress gloves shall conform to the specification requirements in Table 1.

7. Test Methods (see Note 1)

7.1 *Breaking Strength (Load)* (woven fabrics only)—Determine the dry-breaking strength (load) in the standard atmosphere for testing textiles as directed in the grab test procedure of Method D 1682-64(1975), using a constant-rate-of-traverse (CRT) tensile-testing machine with the speed of the pulling jaw at 305 ± 13 mm (12 ± 0.5 in.)/min.

NOTE 2—If preferred, the use of a constant-rate-of-extension (CRE) tensile-testing machine may be used. The crosshead speed should be as agreed upon between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and with the CRE machine. Consequently, these two breaking-load testers cannot be used interchangeably. In case of controversy, the CRT method shall prevail.

7.2 *Bursting Strength* (knit fabrics only)—Determine the bursting strength of knit fabrics as directed in Methods D 3786-79 or D 3787-79 as agreed upon between the purchaser and the seller.

NOTE 3—Care should be taken to subtract the tare diaphragm pressure from the gross pressure to obtain actual bursting strength of fabric when using the diaphragm bursting tester. Calibrate the equipment according to manufacturer's instructions before use. Since there is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphgram bursting tester, these two bursting testers cannot be used interchangeably. In case of controversy, the CRT machine equipped with a bursting attachment method shall prevail.

NOTE 4—The precision of the ball burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm bursting tester method are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the type of material to be evaluated.

7.3 *Tongue-Tear Strength* (woven fabrics only)—Determine the tear strength as directed in Method D 2262 - 71(1976).

NOTE 5—If preferred, use of Methods D 1424-63(1975) or D 2261-71(1976) is permitted with existing requirements as given in this specification. There may be no overall correlation between the results obtained with the tongue-tear machines and with the Elmendorf machine. Consequently, these three tear testers cannot be used interchangeably. In case of controversy, Method D 2262-71(1976) shall prevail.

7.4 *Resistance to Yarn Slippage* (woven fabrics only)—Determine the resistance to yarn slippage as directed in Method D 434-75.

NOTE 6—The precision of Method D 434-75 is being established, and it may not be suitable for fabrics with a low number of warp (ends) and filling (picks) counts (see 4.2).

7.5 *Dimensional Change.*

7.5.1 *Laundering*—Determine the maximum-dimensional change after five launderings, or as agreed upon between the purchaser and the seller, as directed in the applicable procedure in AATCC Method 135-1978.

7.5.1.1 The wash conditions and drying procedures shall be as specified by the seller.

7.5.2 *Drycleaning*—Determine the maximum-dimensional change after three drycleanings or as agreed upon between the purchaser and the seller as directed in 10.1.1 through 10.1.5 of Method D 2724-79.

NOTE 7—Launderable fabrics are expected to be dry-cleanable except where all or part of the fabric is not dry-cleanable and is so labeled. For example, the fabric could contain a functional finish that is soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. "Dry-cleanable" goods are to be drycleaned only.

7.6 *Colorfastness*:

7.6.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes (on the original fabric and after one laundering or one drycleaning) as directed in AATCC Method 23-1975 after 1 cycle.

NOTE 8—Washing conditions shall be the same as those used in 7.5.1.1. Drycleaning conditions shall be the same as those used in 7.5.2 (Note 7).

7.6.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1980. The test conditions shall be as specified by the seller (Note 7).

7.6.3 *Drycleaning*—Determine the colorfastness to drycleaning as directed in AATCC Method 132-1979 (Note 7).

7.6.4 *Crocking*—Determine the colorfastness to dry and wet crocking as directed in AATCC Method 8-1977 for solid shades and AATCC Method 116-1977 for prints, or as agreed upon between the purchaser and the seller.

7.6.5 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1979.

7.6.6 *Light*—Determine the colorfastness to light as directed in AATCC Method 16A-1977 or AATCC Method 16E-1978.

NOTE 9—There is a distinct difference in spectral distribution between the xenon-fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1978 shall prevail.

7.7 *Flammability*—The flammability requirements shall be as agreed upon between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 **Specification Requirements**

NOTE—Class in color change and color transfer is based on a numerical scale of 5 for negligible color change or color transfer to 1 for very severe color change or color transfer.

Characteristic	Requirements		Section
	Knit	Woven	
Breaking strength (load)(CRT)[D]	...	222 N (50 lbf), min	7.1
Bursting strength (ball burst)[D]	323 N (75 lbf), min	...	7.2.
Tongue-tear strength[D]	...	11 N (2.5 lbf), min	7.3
Yarn slippage	...	6.3 mm (¼ in.) separation @ 111 N (25 lbf), min	7.4
Dimensional change:			
Laundering	5 %, max	3 %, max	7.5.1
Drycleaning	5 %, max	3 %, max	7.5.2
Colorfastness:			
Burnt gas fumes—1 cycle:			7.6.1
Shade change, original fabric	Class 4[A], min	Class 4[A], min	
Shade change, after one laundering or one drycleaning	Class 4[A], min	Class 4[A], min	
Laundering:			7.6.2
Shade change	Class 4[A], min	Class 4[A], min	
Staining	Class 3[B], min	Class 3[B], min	
Drycleaning:			7.6.3
Shade change	Class 4[A], min	Class 4[A], min	
Crocking:			7.6.4
Dry	Class 4[C], min	Class 4[C], min	
Wet	Class 3[C], min	Class 3[C], min	
Perspiration:			7.6.5
Shade change	Class 4[A], min	Class 4[A], min	
Staining	Class 3[B], min	Class 3[B], min	
Light (20 AATCC FU)(xenon-arc)	Step 4[A], min	Step 4[A], min	7.6.6
Flammability	Pass	Pass	7.7

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] There is more than one method that can be used to measure breaking strength (load), bursting strength, tear strength, and lightfastness. These methods cannot be used interchangeably since there may be no overall correlation between them (see Notes 2, 3, 4, 5, and 9).

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Standard Performance Specification for
WOMEN'S AND GIRLS' KNITTED AND WOVEN CORSET-GIRDLE-COMBINATION FABRICS[1]

This standard is issued under the fixed designation D 4116; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers women's and girls' knitted and woven corset-girdle-combination fabrics composed of any fiber or mixture of textile fabrics.

1.2 This performance specification is not applicable to knitted or woven corset-girdle-combination fabrics, to knitted lace fabrics, and to fabrics used for interlinings.

1.3 These requirements apply to the length and width directions for those properties where each fabric direction is pertinent.

NOTE 1—The specific dated edition of ASTM and AATCC methods that prevail in this specification are referenced in Section 7 on Test Methods.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[3]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[3]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[3]

D 2261 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Extension Tensile Testing Machine)[3]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

D 3786 Test for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics—Diaphragm Bursting Strength Tester Method[3]

D 3787 Test for Bursting Strength of Knitted Goods—Constant-Rate-of-Traverse (CRT) Ball Burst Test[3]

2.2 *AATCC Methods*:[4]

8 Colorfastness to Crocking: AATCC Crockmeter Method

15 Colorfastness to Perspiration

16A Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23 Colorfastness to Burnt Gas Fumes

61 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124 Appearance of Durable Press Fabrics after Repeated Home Launderings

135 Dimensional Changes in Automatic Home Laundering of Woven or Knit Fabrics

Evaluation Procedure No. 1 Gray Scale for Color Change

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved March 26, 1982. Published June 1982.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

Evaluation Procedure No. 2 Gray Scale for Staining

Evaluation Procedure No. 3 AATCC Chromatic Transference Scale.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC methods and to Definition D 123.

4. Uses and Significance

4.1 Upon agreement between the purchaser and the seller, fabrics intended for this end use should meet all the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified upon agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4116 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and methods are discussed in the appropriate sections of the specified methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable methods.

5.2.1 If there has been no prior agreement and the method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot), when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of knitted and woven fabrics for women's and girls' corset-girdle combinations shall conform to the specification requirements in Table 1.

7. Test Methods (see Note 1)

7.1 *Breaking Strength (load)* (woven fabrics only)—Determine the dry-breaking strength (load) in the standard atmosphere for testing textiles, as directed in the grab test procedure of Method D 1682-64(1975) using a constant-rate-of-traverse (CRT) tensile-testing machine with the speed of the pulling jaw at 305 ± 13 mm (12 ± 0.5 in.)/min.

Note 2—If preferred, a constant-rate-of-extension (CRE) tensile-testing machine may be used. The crosshead speed should be as agreed upon between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and with the CRE machine. Consequently, these two breaking load testers cannot be used interchangeably. In case of controversy, the CRT method shall prevail.

7.2 *Bursting Strength* (knit fabrics only)—Determine the bursting strength of knit fabrics as directed in Methods D 3786-79 or D 3787-79 as agreed upon between the purchaser and the seller.

Note 3—Care should be taken to subtract the tare diaphragm pressure from the gross pressure to obtain actual bursting strength of fabric when using the diaphragm bursting tester. Calibrate the equipment according to manufacturer's instruction before use. Since there is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphragm bursting tester, these two bursting testers cannot be used interchangeably. In case of controversy, the CRT machine equipped with a bursting attachment method shall prevail.

Note 4—The precision of the ball burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm bursting tested method are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the type of material to be evaluated.

7.3 *Tongue-Tear Strength* (woven fabrics only)—Determine the tear strength as directed in Method D 2262-71(1976).

Note 5—If preferred, the use of Methods D 1424-63(1975) or D 2261-71(1976) is permitted with existing requirements as given in this specification. There may be no overall correlation between the results obtained with the tongue-tear machines and with the Elmendorf machine. Consequently, these three testers cannot be used interchangeably. In case of controversy, Method D 2262-71(1976) shall prevail.

7.4 *Resistance to Yarn Slippage* (woven fabrics only)—Determine the resistance to yarn slippage as directed in Method D 434-75.

Note 6—The precision of Method D 434-75 is being established, and it may not be suitable for fabrics with a low number of warp (ends) and filling (picks) counts (see 4.2).

7.5 *Dimensional Change*:

7.5.1 Laundering—Determine the maximum-dimensional change after five launderings, or as agreed upon between the purchaser and the seller, as directed in the applicable procedure in AATCC Method 135-1978.

7.6 *Colorfastness*:

7.6.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23-1975 after 1 cycle.

Note 7—Washing conditions shall be the same as those used in 7.5.1.

7.6.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1980. The test conditions shall be as specified by the seller.

7.6.3 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1977 for solid shades and AATCC Method 116-1974 for prints, or as agreed upon between the purchaser and the seller.

7.6.4 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1979.

7.6.5 *Light*—Determine colorfastness to light as directed in AATCC Method 16A-1977 or AATCC Method 16E-1978.

Note 8—There is a distinct difference in spectral distribution between the xenon-fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1976 shall prevail.

7.7 *Flammability*—The flammability requirements shall be as agreed upon between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 Specification Requirements

NOTE—Class in colorfastness is based on a numerical scale of 5 for negligible color change or color transfer to 1 for very severe color change or color transfer.

Characteristic	Requirements		Section
	Knit	Woven	
Breaking strength (load)(CRT)[D]	. . .	301 N (70 lbf), min	7.1
Bursting strength (ball burst)[D]	222 N (50 lbf), min	. . .	7.2
Tongue-tear strength[D]	. . .	13 N (3 lbf), min	7.3
Yarn slippage	. . .	6 mm (¼ in.) separation @ 155 N (35 lbf), min	7.4
Dimensional change:			
Laundering			7.5.1
Length	5 % max	5 % max	
Width	5 % max	3 % max	
Colorfastness:			
Burnt gas fumes—1 cycle:			7.6.1
Shade change, original fabric	Class 4^A, min	Class 4^A, min	
Shade change, after one laundering	Class 4^A, min	Class 4^A, min	
Laundering:			7.6.2
Shade change	Class 4^A, min	Class 4^A, min	
Staining	Class 3^B, min	Class 3^B, min	
Crocking:			7.6.3
Dry	Class 4^C, min	Class 4^C, min	
Wet	Class 3^C, min	Class 3^C, min	
Perspiration:			7.6.4
Shade change	Class 4^A, min	Class 4^C, min	
Staining	Class 3^B, min	Class 3^C, min	
Light (10 AATCC FU)[D](xenon-arc)	Step 4^A, min	Step 4^B, min	7.6.5
Flammability	pass	pass	7.7

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] There is more than one method that can be used to measure breaking strength (load).

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Designation: D 4117 - 82

Standard Performance Specification
WOMEN'S AND GIRLS' WOVEN ROBE, NEGLIGEE, NIGHTGOWN, PAJAMA, SLIP, AND LINGERIE FABRICS[1]

This standard is issued under the fixed designation D 4117; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers women's and girls' woven robe, negligee, nightgown, pajama, slip, and lingerie fabrics composed of any fiber or mixture of textile fibers.

1.2 These requirements apply to the length and width directions for those properties where each fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]

D 434 Test for Resistance of Slippage of Yarns in Woven Fabrics Using a Standard Seam[3]

D 1336 Test for Distortion of Yarn in Woven Fabrics[3]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[3]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[3]

D 2261 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Extension Tensile Testing Machine)[3]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[3]

D 2724 Testing Bonded and Laminated Apparel Fabrics[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

2.2 *AATCC Methods*:[4]

8 Colorfastness to Crocking: AATCC Crockmeter Method

15 Colorfastness to Perspiration

16A Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23 Colorfastness to Burnt Gas Fumes

61 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124 Appearance of Durable Press Fabrics after Repeated Home Launderings

132 Colorfastness to Drycleaning

135 Dimensional Changes in Automatic Home Laundering of Woven or Knit Fabrics

Evaluation Procedure No. 1 Gray Scale for Color Change

Evaluation Procedure No. 2 Gray Scale for Staining

Evaluation Procedure No. 3 AATCC Chromatic Transference Scale.

NOTE 1—The specific dated editions of the ASTM and AATCC methods that prevail in this are referenced in Section 7.

3. Definitions

3.1 *sheer, n*—a fabric that is transparently thin or diaphanous.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

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[2] *Annual Book of ASTM Standards*, Part 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

3.1.1 *Discussion*—there is no clear distinction between sheer fabrics and nonsheer fabrics. The purchaser and seller should agree in advance as to which category a fabric should be classified.

3.2 For definitions of other textile terms used in this specification, refer to the individual ASTM and AATCC methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified upon agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4117 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and methods are discussed in the appropriate sections of the specified methods

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable methods.

5.2.1 If there has been no prior agreement and the method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot), when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of woven fabrics for women's and girls' robes, negligees, nightgowns, pajama, slips, and lingerie shall conform to the specification requirements in Table 1.

7. Test Methods (see Note 1)

7.1 *Breaking Strength (Load)*—Determine the dry-breaking strength (load), in the standard atmosphere for testing textiles, as directed in the grab test procedure of Method D 1682-64(1975), using a constant-rate-of-traverse (CRT) tensile-testing machine with the speed of the pulling jaw at 305 ± 13 mm (12 ± 0.5 in.)/min.

NOTE 2—If preferred, the use of a constant-rate-of-extension (CRE) tensile-testing machine is permitted. The crosshead speed should be as agreed upon between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and the CRE machine. Consequently, these two breaking-load testers cannot be used interchangeably. In case of controversy, the CRT method shall prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434-75.

NOTE 3—The precision of Method D 434-75 is being established, and it may not be suitable for fabrics with a low number of warp (ends) and filling (picks) counts (see 4.2).

7.3 *Tongue-Tear Strength*—Determine the tongue-tear strength as directed in Method D 2262-71(1976).

NOTE 4—If preferred, use of Methods D 1424-63(1975) and D 2261-71(1976) is permitted with existing requirements as given in this specification. There may be no overall correlation between the results obtained with the tongue-tear machines and the Elmendorf machine. Consequently, these three tear testers cannot be used interchangeably. In case of controversy, Method D 2267-71(1976) shall prevail.

7.4 *Yarn Distortion*—Determine the yarn distortion as directed in Method D 1336-72(1977).

7.5 *Dimensional Change*:

7.5.1 *Laundering*—Determine the maximum-dimensional change after five launderings or as agreed upon between the purchaser and the seller as directed in the applicable procedure in AATCC Method 135-1978 (Note 5).

7.5.1.1 The wash conditions and drying procedure shall be as specified by the seller.

7.5.2 *Drycleaning*—Determine the maximum-dimensional changes after three drycleanings or as agreed upon between the purchaser and the seller, as directed in 10.1.1 through 10.1.5 of Method D 2724-79.

NOTE 5—Launderable fabrics are expected to the dry-cleanable except where all or part of the fabric is not dry-cleanable and is so labeled. For example, the fabric could contain a functional finish that is soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. "Drycleanable" goods are to be drycleaned only.

7.6 *Colorfastness*:

7.6.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23-1975 after 2 cycles.

NOTE 6—Washing conditions shall be the same as those used in 7.5.1.1. Drycleaning conditions shall be the same as those used in 7.5.2.

7.6.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1980. The test conditions shall be as specified by the seller (Note 5).

7.6.3 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132-1979 (Note 5).

7.6.4 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1979 for solid shades and AATCC Method 116-1977 for prints, or as agreed upon between the purchaser and the seller.

7.6.5 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1979.

7.6.6 *Light*—Determine colorfastness to light as directed in AATCC Methods 16A-1977 or 16E-1978.

NOTE 7—There is a distinct difference in spectral distribution between the xenon-fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1978 shall prevail.

7.7 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124-1978 after laundering using the wash-and-wear cycle or the normal cycle as agreed upon between the purchaser and the seller as specified in 7.5.1.1 for washable fabrics or after drycleaning as specified in 7.5.2 for drycleanable fabrics (see Note 5).

7.7.1 For fabrics not intended for use in durable press garments determine the fabric smoothness after pressing as specified in 10.2.5 of Method D 2724-79.

7.7.1.1 The fabric smoothness or durable press (DP) rating of such fabrics, and the DP rating of dry-cleaned fabrics, shall have decreased no more than ½ (DP) rating from that of the fabric before it is laundered or drycleaned.

7.8 *Flammability*—The flammability requirements shall be as agreed upon between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 Specification Requirements

NOTE—Class in colorfastness is based on a numerical scale of 5 for negligible color change or color transfer to 1 for very severe color change or color transfer.

Characteristic	Requirements		Section
	Sheer Fabrics	Non-Sheer Fabrics	
Breaking strength (load)(CRT)[D]	67 N (15 lbf), min	8.9 N (20 lbf), min	7.1
Yarn slippage	6 mm (¼ in.) separation at 44 N (10 lbf), min	6 mm (¼ in.) separation at 67 N (15 lbf), min	7.2
Tongue-tear strength[D]	4.4 N (1 lbf), min	6.7 N (1.5 lbf), min	7.3
Yarn distortion:			7.4
Satins	2.5 mm (0.1 in.), max at 4.4 N (1 lbf) load	2.5 mm (0.1 in.), max at 4.4 N (1 lbf) load	
All other	1 mm (0.05 in.) max at 4.4 N (1 lbf) load	1 mm (0.05 in.), max at 4.4 N (1 lbf) load	
Dimensional change:			
Laundering	2.5 %, max	2.5 %, max	7.5.1
Drycleaning	2.0 %, max	2.0 %, max	7.5.2
Colorfastness:			
Burnt gas fumes—2 cycles:			7.6.1
Shade change, original fabric	Class 4[A], min	Class 4[A], mn	
Shade change, after one laundering or one drycleaning	Class 4[A], min	Class 4[A], min	
Laundering:			7.6.2
Shade change	Class 4[A], min	Class 4[A], min	
Staining	Class 3[B], min	Class 3[B], min	
Drycleaning:			7.6.3
Shade change	Class 4[A], min	Class 4[A], min	
Crocking:			7.6.4
Dry	Class 4[C], min	Class 4[C], min	
Wet	Class 3[C], min	Class 3[C], min	
Perspiration:			7.6.5
Shade change	Class 4[A], min	Class 4[A], min	
Staining	Class 3[B], min	Class 3[B], min	
Light (10 AATCC FU)(xenon-arc)	Step 4[A], min	Step 4[A], min	7.6.6
Fabric appearance (see 7.7.1.1)	DP 3.5, min	DP 3.5, min	7.7
Flammability	pass	pass	7.8

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] There is more than one method that can be used to measure breaking strength (load), tear strength, and lightfastness. These methods cannot be used interchangeably since there may be no overall correlation between them (see Notes 2, 4, and 7).

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Standard Performance Specification for
WOMEN'S WOVEN COVERALL, DUNGAREE, OVERALL, AND SHOP COAT FABRICS[1]

This standard is issued under the fixed designation D 4118; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers woven fabrics, composed of any textile fiber or mixture of textile fibers, to be used in the manufacture of women's coveralls, dungarees, overalls and shop coats.

1.2 This performance specification recognizes two levels of wearing severity relative to performance requirements for these fabrics.

1.3 This performance specification is not applicable to woven fabrics intended for use in the manufacture of industrial-protective clothing.

1.4 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus[3]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[3]

D 2261 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Extension Tensile Testing Machine)[3]

D 2262 Test For Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[3]

D 2724 Testing Bonded and Laminated Apparel Fabrics[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

2.2 *AATCC Methods*[4]:

8 Colorfastness to Crocking: AATCC Crockmeter Method

15 Colorfastness to Perspiration

16A Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23 Colorfastness to Burnt Gas Fumes

61 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

96 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool

116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124 Appearance of Durable Press Fabrics After Repeated Home Launderings

132 Colorfastness to Drycleaning

135 Dimensional Changes in Automatic Home Laundering of Woven or Knit Fabrics

Evaluation Procedure No. 1 Gray Scale for Color Change

Evaluation Procedure No. 2 Gray Scale for Staining

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved March 26, 1982. Published June 1982.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] AATCC Technical Manual, available from American Association of Textile Chemists and Colorists, P. O. Box 12215, Research Triangle Park, N.C. 27709.

Evaluation Procedure No. 3 Chromatic Transference Scale.

NOTE 1—The specific dated editions of the methods that prevail in this specification are referenced in Section 7 on Test Methods.

3. Terminology

3.1 For definitions of textile terms used in this standard, refer to the individual ASTM and AATCC methods and to Definitions D 123.

3.2 *Discussion of Terms*:

3.2.1 Type I apparel is designed for generally heavy work. It may be subjected to severe exposure to breaking and tearing stresses indoors or out.

3.2.2 Type II apparel is designed for light work or leisure activities. It may not be expected to undergo severe physical stresses.

4. Uses and Significance

4.1 Upon agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified upon agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4118 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and methods are discussed in the appropriate sections of the specified methods.

5. Sampling

5.1 All tests, except dimensional change in pressing and finishing, shall be performed on the fabric as it will reach the consumer.

5.1.1 Dimensional change in pressing and finishing must be determined on a sample obtained from unfinished, durable press finished fabric when the material is designed for post-finished durable press garments.

NOTE 2—Dimensional change in pressing and finishing is of interest only to the garment manufacturer; the consumer will never see fabric at this stage of processing.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable methods.

5.2.1 If there has been no prior agreement and the method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot), when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for women's coverall, dungaree, overall, and shop coats shall conform to the specification requirements in Table 1.

7. Test Method

7.1 *Breaking Strength* (*load*)—Determine the breaking strength, in the standard atmosphere for testing textiles, as directed in the grab test procedure of Method D 1682-64(1975), using a constant-rate-of-traverse (CRT) tensile-testing machine with the speed of the pulling jaw at 305 ± 13 mm (12 ± 0.5 in.)/min.

NOTE 3—If preferred, the use of a constant-rate-of-extension (CRE) tensile-testing machine is permitted. The crosshead speed should be as agreed upon between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT and the CRE machines. Consequently, these two machines may not be used interchangeably. In case of controversy, the CRT machine shall prevail.

7.2 *Tearing Strength*—Determine the tearing strength as directed in Method D 2262-71(1976).

NOTE 4—If preferred, the use of Methods D 1424-63(1975) and D 2261-71(1976) is permitted with existing requirements as given in this specification. There may be no overall correlation between the results obtained with the tongue-tear methods and the Elmendorf method. Consequently, these three methods cannot be used interchangeably. In case of controversy, Method D 2262-71(1976) shall prevail.

7.3 *Dimensional Change*:

7.3.1 *Pressing and Finishing During Garment Manufacturing*[5]—Mark specimen(s) as directed in 4.3.1 of AATCC Method 135-1978. Press and finish specimen(s) as agreed upon between the purchaser and the seller with respect to time cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135-1978.

7.3.2 *Laundering*—Determine the maximum-dimensional change after 5 launderings as directed in the applicable procedure in AATCC Method 135-1978 or as agreed upon between the purchaser and the seller.

7.3.2.1 Non-durable press fabrics shall be ironed before measuring as directed in Section 5.12 of AATCC Method 96-1975.

7.3.2.2 The wash conditions and drying procedure shall be as specified by the seller.

NOTE 5—Launderable fabrics are expected to be dry-cleanable except where all or part of the fabric is not dry-cleanable and is so labeled. For example, the fabric could contain a functional finish that is soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. "Dry-cleanable" goods are to be drycleaned only.

NOTE 6—Specimens prepared for 7.3.1 may be used for 7.3.2 or 7.3.3 as desired. When this is done, the dimensional change due to laundering or drycleaning is calculated using Eq 1. The dimensional change to pressing and finishing is determined on the fabric as it will reach the user. It is not additive to the dimensional change to laundering or drycleaning of the fabric as it will reach the consumer (see 5.1).

$$\text{Percent Dimensional Change} = 100(D_1 - D_2)/D_2 \quad (1)$$

where:

D_1 = the measurement after laundering and drycleaning, and

D_2 = the measurement after pressing and finishing.

7.3.3 *Drycleaning*—Determine the maximum-dimensional change after three drycleanings as directed in 10.1.1 through 10.1.5 of Method D 2724-79.

7.4 *Colorfastness*:

7.4.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23-1975.

NOTE 7—Washing conditions shall be the same as those used in 7.3.2.2.

7.4.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure to AATCC Method 61-1975. The test conditions shall be as specified by the seller (Note 5).

7.4.3 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1977 for solid shades and AATCC Method 116-1977 for prints, or as agreed upon between the purchaser and the seller.

7.4.4 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1979.

7.4.5 *Light*—Determine colorfastness to light as directed in AATCC Methods 16A-1977 or 16E-1978.

NOTE 8—There is a distinct difference in spectral distribution between the xenon-fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1978 shall prevail.

7.4.6 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132-1979.

7.5 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124-1978 after laundering using the wash-and-wear cycle or the normal cycle as agreed upon between the purchaser and the seller as specified in 7.3.2.2 or drycleaning as specified in 7.3.3 for dry-cleanable fabrics (Note 5).

7.5.1 For fabrics not intended for use in durable press garments determine the fabric smoothness after pressing as specified in 7.3.2.1.

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[5] The development of a method has been referred to Subcommittee D13.59 on Fabric Test Methods, General.

7.5.1.1 The fabric smoothness or durable press (DP) rating of such fabrics, and the DP rating of dry-cleaned fabrics shall have decreased no more than ½ DP rating from that of the fabric before it is laundered or drycleaned.

7.6 *Flammability*—The flammability requirements shall be as agreed upon between purchaser and seller, except when regulated by applicable Government mandatory standards.

TABLE 1 Specification Requirements

NOTE—Class for colorfastness and DP rating is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for very severe color change, color transfer, or wrinkle. The numerical rating in Table 1 or a higher numerical rating is acceptable.

Characteristic	Requirements		Section
Breaking strength (load) (CRT):			7.1
Type I	222 N (50 lbf), min		
Type II	178 N (40 lbf), min		
Tongue-tear strength (CRT):			7.2
Type I	11 N (2.5 lbf), min		
Type II	9 N (2.0 lbf), min		
Dimensional change			
Pressing and Finishing (DP fabrics)	2 % max		7.3.1
Laundering (DP fabrics)	2.5 % max		7.3.2
Laundering (non-DP fabrics)	3.0 % max		7.3.2.1
Drycleaning	2.5 % max		7.3.3
Colorfastness:	Non-Indigo Dyed	Indigo-Dyed	
Burnt gas fumes—2 cycles:			7.4.1
Shade change, original fabric	Class 4[A], min	Class 4[A], min	
Shade change, after 1 laundering or drycleaning	Class 4[A], min	Class 4[A], min	
Laundering:			7.4.2
Shade change	Class 4[A], min	Class 2[A], min	
Staining	Class 3[B], min	Class 2[B], min	
Crocking:			7.4.3
Dry	Class 4[C], min	Class 3[C], min	
Wet	Class 3[C], min	Class 2[C], min	
Perspiration:			7.4.4
Shade change	Class 4[A], min	Class 3[A], min	
Staining	Class 3[B], min	Class 3[B], min	
Light (20 AATCC FU) (xenon-arc)	Step 4[A], min	Step 4[A], min	7.4.5
Drycleaning			
Shade change	Class 4[A], min	Class 3[A], min	7.4.6
Fabric appearance (see 7.5.1.1)	DP 3.5 min	DP 3.5 min	7.5
Flammability	pass	pass	7.6

[A] AATCC Gray Scale for Color change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

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Standard Performance Specification for
MEN'S AND BOYS' KNITTED DRESS SHIRT FABRICS[1]

This standard is issued under the fixed designation D 4119; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers men's and boy's knitted dress shirt fabrics composed of any textile fiber or mixture of textile fibers.

1.2 This performance specification is not applicable to knitted fabrics used for interlinings.

1.3 These requirements apply to both the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]

D 2594 Tests for Stretch Properties of Knitted Fabrics Having Low Power[3]

D 2724 Testing Bonded and Laminated Apparel Fabrics[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

D 3786 Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics—Diaphragm Bursting Strength Tester Method[3]

D 3787 Bursting Strength of Knitted Goods—Constant-Rate-of-Traverse (CRT) Ball Burst Test[3]

2.2 *AATCC Methods*:[4]

8 Colorfastness to Crocking: AATCC Crockmeter Method

15 Colorfastness to Perspiration

16A Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23 Colorfastness to Burnt Gas Fumes

61 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

96 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool

116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124 Appearance of Durable Press Fabrics after Repeated Home Launderings

132 Colorfastness to Drycleaning

135 Dimensional Changes in Automatic Home Laundering of Woven and Knit Fabrics

Evaluation Procedure No. 1 Gray Scale For Color Change

Evaluation Procedure No. 2 Gray Scale for Staining

Evaluation Procedure No. 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM and AATCC methods that prevail in this specification are referenced in Section 7 on Test Methods.

3. Terminology

3.1 *Definitions*:

3.1.1 *dimensional change, n.*—in pressing and finishing of textiles, the change in dimensions of a fabric caused by pressing and finishing during garment manufacture.

3.1.2 For definitions of other textile terms used in this specification, refer to the individual ASTM and AATCC methods and to Definitions D 123.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved Aug. 23, 1982. Published October 1982.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] AATCC Technical Manual, available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

3.2 *Description of Term*:

3.2.1 Pressing and finishing takes into account all of the industrial pressing and finishing treatments used in garment production.

NOTE 2—No method is available for reproducing on a laboratory level the results of industrial press or finishing treatments, or both, used in the manufacture of garments.[5]

4. Uses and Significance

4.1 Upon agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified upon agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4119 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and methods are discussed in the appropriate sections of the specified methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer. Any "partially finished" or "post finished" fabrics should first be processed as directed in the fabric manufacturer's instructions.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable methods.

5.2.1 If there has been no prior agreement and the method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying the method to the entire lot), when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for men's and boy's knitted dress shirts shall conform to the specification requirements in Table 1.

7. Test Method (see Note 1)

7.1 *Bursting Strength*—Determine the bursting strength, in the standard atmosphere for testing textiles, as directed in Method D 3787-79 using an approved type of constant-rate-of-traverse (CRT) machine equipped with a bursting attachment or Method D 3787-79 using an approved type of diaphragm bursting tester as agreed upon between the purchaser and the seller.

NOTE 3—There is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphragm bursting tester. Consequently, these two bursting testers should not be used interchangeably. In case of controversy, the CRT machine equipped with a bursting attachment method shall prevail.

NOTE 4—The precision of the ball burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm bursting tester method are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the material to be evaluated.

7.2 *Dimensional Change*:

7.2.1 *Pressing and Finishing During Manufacturing*—Mark specimen(s) as directed in 4.4 of AATCC Method 135-1978. Press and finish specimen(s) as agreed upon between the purchaser and the seller with respect to time cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135-1978 (see Note 2).

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[5] The development of a method has been referred to Subcommittee D13.59.

7.2.1.1 If no agreement has been made between the purchaser and the seller, press the specimen(s) using a flat-bed steam press and using a cycle as directed in 10.1.4.1 through 10.1.4.5 of Method D 2724-78.

7.2.2 *Laundering*—Determine the maximum-dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135-1978 (Notes 5 and 6).

7.2.2.1 The wash conditions and drying procedure shall be as specified by the seller.

7.2.2.2 When the dimensional change after five launderings exceeds 3 %, determine the stretch of the fabric after five launderings as directed in Method D 2594-72(1977) using a 2.2–N (0.5–lbf) load. If the difference between the percent stretch of the laundered fabric and the percent shrinkage due to laundering does not exceed 3 % shrinkage, then the fabric meets the specification requirements in Table 1.

7.2.3 *Drycleaning*—Determine the maximum-dimensional change after three drycleanings as directed in 10.1.1 through 10.1.4 of Method D 2724-78 (Notes 5 and 6).

7.2.4 *Growth*—Determine the growth of the fabric as directed in Method D 2594-72(1977).

NOTE 5—Launderable fabrics are expected to be dry-cleanable except where all or part of the fabric is not dry-cleanable and is so labeled. For example, the fabric could contain a functional finish that is soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. Goods labeled "Dry-cleanable" are to be drycleaned only.

NOTE 6—Specimens prepared for 7.2.1 may be used for 7.2.2 and 7.2.3 as desired. When this is done, subtract the pressing and curing dimensional change from the total dimensional change to obtain that portion due to laundering or drycleaning. The dimensional change to pressing and finishing is determined on the fabric as it will reach the user. It is not to be added to the dimensional change due to laundering or drycleaning of the fabric as it will reach the consumer (see 5.1).

7.3 *Colorfastness*:

7.3.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23-1975.

NOTE 7—Washing conditions shall be the same as those used in 7.2.2.1. Drycleaning conditions shall be the same as those used in 7.2.3.

7.3.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1975. The test conditions shall be as directed in AATCC Method 135-1978 (Note 5).

7.3.3 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132-1979 (Note 5).

7.3.4 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1977 for solid shades and AATCC Method 116-1977 for prints, or as agreed upon between the purchaser and the seller.

7.3.5 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1979.

7.3.6 *Light*—Determine colorfastness to light as directed in AATCC Methods 16A-1977 or 16E-1978.

NOTE 8—There is a distinct difference in spectral distribution between the xenon-fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1978 shall prevail.

7.4 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124-1978 after laundering using the wash-and-wear cycle or the normal cycle as agreed upon between the purchaser and seller as specified in 7.2.2.1 for washable fabrics or as specified in 7.2.3 for dry-cleanable fabrics (see Note 5).

7.4.1 For fabrics not intended for use in durable press garments determine the fabric smoothness after pressing as specified in 5.12 of AATCC Method 96-1975.

7.4.1.1 The fabric smoothness or durable press (DP) rating of such fabrics, and the DP rating of dry-cleaned fabrics, shall have decreased no more than ½ DP rating from that of the fabric before it is laundered or drycleaned.

7.5 *Flammability*—The flammability requirements shall be as agreed upon between the purchaser and the seller, except when regulated by applicable Government mandatory standards.

TABLE 1 Specification Requirements

NOTE—Class in a,b,c and DP is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for very severe color change, color transfer, or wrinkle. The numerical rating in Table 1 or a higher numerical rating is acceptable.

Characteristic	Requirements	Section
Bursting strength (load) (ball burst)	222 N (50 lbf)	7.1
Dimensional change:		
Pressing and finishing	2 % max	7.2.1
After 5 launderings (see 7.2.2.2 if shrinkage exceeds 3%)	3 % max	7.2.2
After 3 drycleanings	3 % max	7.2.3
Growth	3 % max	7.2.4
Colorfastness:		
Burnt gas fumes—2 cycles:		
Shade change, original fabric	Class 4[A], min	7.3.1
Shade change after 1 laundering or 1 drycleaning	Class 4[A], min	
Laundering:		
Shade change	Class 4[A], min	7.3.2
Staining	Class 3[B], min	
Drycleaning:		
Shade change	Class 4[A], min	7.3.3
Crocking:		
Dry	Class 4[C], min	7.3.4
Wet	Class 3[C], min	
Perspiration:		
Shade change	Class 4[A], min	7.3.5
Staining	Class 3[B], min	
Light (20 AATCC FU) (xenon-arc)	Step 4[A], min	7.3.6
Fabric appearance (see 7.4.1.1)	DP 3.5[D], min	7.4
Flammability	Pass	7.5

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] For durable press fabrics only.

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Designation: D 4152 - 82

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Standard Performance Specification for
WOVEN INSTITUTIONAL DISH, HUCK, AND TERRY BATH TOWEL FABRICS[1]

This standard is issued under the fixed designation D 4152; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers woven dish, huck and terry bath towel fabrics as used in hotels, hospitals, industrial and other institutional establishments.

1.2 These requirements apply to the length and width directions for those properties where fabric direction is pertinent.

1.3 These requirements are not applicable to woven terry fabrics used for apparel.

2. Applicable Documents

2.1 *ASTM Standards*:
D 123 Definitions of Terms Relating to Textiles[2,3]
D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[2]
D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of a Textile Material[2]

2.2 *AATCC Methods:*[4]
8-1977 Colorfastness to Crocking: AATCC Crockmeter Method
16A-1977 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light
16E-1978 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light
61-1980 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated
96-1980 Dimensional Changes in Laundering of Woven and Knitted Textiles Except Wool
97-1978 Noncotton Content of Bleached Cotton Textiles
116-1977 Colorfastness to Crocking: Rotary Vertical Crockmeter Method
Evaluation Procedure 1 Gray Scale for Color Change
Evaluation Procedure 2 Gray Scale for Staining
Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D 13.56 on Performance Standards for Textile Fabrics.

Current edition approved Oct. 1, 1982. Published October 1982.

[2] *Annual Book of ASTM Standards*, Part 32.

[3] *Annual Book of ASTM Standards*, Part 33.

[4] Available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4152 except for the following characteristic(s)".

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of woven fabrics for institutional dish, huck and terry bath towels shall conform to the specification requirements in Table 1.

7. Test Methods (see Note 1)

7.1 *Breaking Strength* (*Load*)—Determine the dry breaking strength, in the standard atmosphere for testing textiles, in accordance with the grab test procedure of Method D 1682 – 64(1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 305 ± 13 mm (12 ± 0.5 in.)/min.

Note 2—If preferred, the use of a constant-rate-of-extension (CRE) tensile testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and with the CRE machine. Consequently, these two breaking load testers cannot be used, interchangeably. In case of controversy, the CRT method shall prevail.

7.2 *Nonfibrous Material*—Determine the nonfibrous material as directed in Sections 4.1 to 4.3 of AATCC Method 97-1978.

7.3 *Dimensional Change*:

7.3.1 *Laundering*—Determine the maximum dimensional change after five launderings, or as agreed between the purchaser and the seller, as directed in AATCC Method 96-1980.

7.3.1.1 The wash conditions and drying procedure shall be as specified by the seller.

7.4 *Absorptive Capacity*—No acceptable standard method is available for the determination of towel fabric absorbency.[5]

7.5 *Colorfastness*

7.5.1 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1980. The test conditions shall be as specified by the seller.

7.5.2 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1979 or AATCC Method 116-1979 for prints or as agreed between the purchaser and the seller.

Note 3—In the case of controversy, AATCC Method 8-1979 shall prevail.

7.5.3 *Light*—Determine colorfastness to light as directed in AATCC Method 16A-1977 or AATCC Method 16E-1978.

Note 4—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1978 shall prevail.

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[5] The development of a standard method has been referred to Subcommittee D 13.59 on Fabric Test Methods, General.

TABLE 1 **Specification Requirements**

NOTE—Class for color change and color transfer is based on a numerical scale of 5 for negligible or no color change or color transfer to 1 for severe color change or color transfer.

Characteristic	Requirements			Section
	Dish	Huck	Terry	
Breaking strength (load) (CRT):				7.1
Length	220 N (50 lbf), min	264 N (60 lbf), min	220 N (50 lbf), min	
Width	178 N (40 lbf), min	220 N (50 lbf), min	178 N (40 lbf), min	
Nonfibrous material	5 % max	5 % max	3 % max	7.2
Dimensional change:				7.3
Length	15 % max	15 % max	10 % max	
Width	5 % max	5 % max	4 % max	
Colorfastness:				
Laundering:				7.5.1
Shade change	Class 4[A] min	Class 4[A] min	Class 4[A] min	
Staining	Class 3[B] min	Class 3[B] min	Class 3[B] min	
Crocking:				
Dry	Class 4[C] min	Class 4[C] min	Class 4[C] min	7.5.2
Wet	Class 3[C] min	Class 3[C] min	Class 3[C] min	
Light (20 AATCC FU)	Step 4[A] min	Step 4[A] min	Step 4[A] min	7.5.3

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

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Designation: D 4153 – 82

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Standard Performance Specification for
MEN'S, WOMEN'S, AND CHILDREN'S WOVEN HANDKERCHIEF FABRICS[1]

This standard is issued under the fixed designation D 4153; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers woven fabrics to be used in the manufacture of men's, women's and children's handkerchiefs, both utilitarian and decorative.

1.2 This performance specification is not applicable to open work fabrics such as lace which is used primarily to decorate handkerchiefs, and to woven fabrics for the manufacture of scarves.

1.3 These requirements apply to both the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]
D 1424 Test for Tear Resistance of Woven Fabrics By Falling-Pendulum (Elmendorf) Apparatus[3]
D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[3]
D 2261 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Extension Tensile Testing Machine)[3]
D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[3]
D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[3]

2.2 *AATCC Methods*:[4]

8 Colorfastness to Crocking: AATCC Crockmeter Method
15 Colorfastness to Perspiration
16A Colorfastness to Light: Carbon-Arc Lamp, Continuous Light
16E Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light
23 Colorfastness to Burnt Gas Fumes
61 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated
96 Dimesional Changes in Laundering of Woven and Knitted Textiles Except Wool
116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method
124 Appearance of Durable Press Fabrics after Repeated Home Launderings
135 Dimensional Changes in Automatic Home Laundering of Woven or Knit Fabrics

NOTE 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the Direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

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[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] AATCC Technical Manual, available from the American Association of Textile Chemists and Colorists, P. O. Box 12215, Research Triangle Park, N.C. 27709.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4153 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of woven fabric for men's, women's and children's handkerchiefs shall conform to the specification requirements in Table 1.

7. Test Methods (see Note 1)

7.1 *Breaking Strength* (*Load*)—Determine the dry breaking strength (load) in the standard atmosphere for testing textiles, as directed in the grab test procedure of Method D 1682 – 64(1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 305 ± 13 mm (12 ± 0.5 in.)/min.

NOTE 2—If preferred, the use of a constant-rate-of-extension (CRE) testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and the CRE machine. Consequently, these two breaking load testers cannot be used interchangeably. In case of controversy, the CRT machine shall prevail.

7.2 *Tear Strength*—Determine the tear strength as directed in Method D 2262 – 71(1976)

NOTE 3—If preferred, the use of Method D 1424 – 1975 or Method D 2261 – 71(1976) is permitted with existing requirements as given in this standard. There may be no overall correlation between the results obtained with the tongue tear machines and the Elmendorf machine. Consequently, these three testers cannot be used interchangeably. In case of controversy, Method D 2262 – 71(1976) shall prevail.

7.3 *Dimensional Change in Laundering*—Determine the maximum dimensional change after five launderings, or as agreed between the purchaser and the seller, as directed in the applicable procedure in AATCC Method 135-1978.

7.4 *Colorfastness*:

7.4.1 *Laundering*—Determine the colorfastness to laundering as directed in AATCC Method 61-1975. The test conditions shall be as specified by the seller.

7.4.2 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering as directed in AATCC Method 23-1975.

NOTE 4—Washing conditions shall be the same as those used in 7.3.

7.4.3 *Crocking*—Determine the colorfastness to dry and wet crocking as directed in AATCC Method 8-1977 for solid shades and AATCC Method 116-1977 for prints or as agreed between the purchaser and the seller.

7.4.4 *Perspiration*—Determine the colorfastness to perspiration as directed in AATCC Method 15-1979.

7.4.5 *Light*—Determine the colorfastness to light as directed in AATCC Method 16A-1977 or AATCC Method 16E-1978.

NOTE 5—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon-arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1978 shall prevail.

7.5 *Fabric Appearance After Repeated Home Launderings*—Determine the fabric appearance as directed in AATCC Method 124-1978 after laundering using the wash-and-wear cycle or the normal cycle as agreed between the purchaser and the seller as specified in 7.3 for washable fabrics.

7.5.1 For fabrics not intended for use in "Durable Press" products, determine the fabric smoothness after pressing as specified in Section 5.12 of AATCC Method 96-1975.

7.5.1.1 The fabric smoothness, or durable press (DP) rating of such fabrics shall have decreased no more than ½ durable press rating from that of the fabric before it is laundered.

7.6 *Flammability*—The flammability requirements shall be as agreed upon by the purchaser and the seller, except when regulated by applicable Federal mandatory standards.

TABLE 1 Specification Requirements

NOTE—The classes of colorfastness and DP rating are based on a numerical scale of 5 for negligible or no color change, color transfer or wrinkle to 1 for very severe color change, color transfer, or wrinkle.

Characteristic	Requirements	Section
Breaking strength (load) (CRT)[E]	80 N (18 lbf), min.	7.1
Tongue tear strength[E]	4.5 N (1 lbf)	7.2
Dimensional change:		
After 5 launderings	50 % max	7.3
Colorfastness to:		
Laundering:		7.4.1
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Burnt gas fumes:	Class 4[A] min	7.4.2
Alteration in shade: 1 cycle on original and after 1 washing	Class 4[A] min	7.4.2
Crocking:		7.4.3
Dry	Class 4[C] min	
Wet	Class 3[C] min	
Perspiration:		7.4.4
Shade change	Class 4[A] min	
Staining	Class 3[B] min	
Light (xenon arc)[E]		7.4.5
20 AATCC Fading units	Step 4[A] min	
Fabric appearance (see 7.5.1.1)	DP 3.5[D] min	7.5
Flammability	pass	7.6

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] For durable press fabrics only.

[E] More than one method can be used to measure these properties. These methods cannot be used interchangeably since there can be no overall correlation between them (see Notes 2, 3, and 5).

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Designation: D 4154 – 82

Standard Performance Specification for
MEN'S AND BOYS' KNITTED AND WOVEN BEACHWEAR AND SPORTS SHIRT FABRICS[1]

This standard is issued under the fixed designation D 4154; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers men's and boys' knitted and woven beachwear and sport shirt fabrics composed of any textile fiber or mixture of textile fibers.

1.2 This performance specification is not applicable to knitted and woven fabrics used for interlining and swimwear.

1.3 These requirements apply to both the length and width directions for those properties where fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2]

D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[3]

D 1424 Test for Tear Resistance of Woven Fabrics by Falling Pendulum (Elmendorf) Apparatus[3]

D 1682 Tests for Breaking Load and Elongation of Textile Fabrics[3]

D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant Rate-of-Traverse Tensile Testing Machine)[3]

D 2594 Test for Stretch Properties of Knitted Fabrics Having Low Power[3]

D 2724 Testing Bonded and Laminated Apparel Fabrics[3]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of a Textiles[3]

D 3786 Test for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method[3]

D 3787 Test for Bursing Strength of Knitted Goods: Constant-Rate-of-Traverse (CRT), Ball Burst Test[3]

2.2 *AATCC Methods*:[4]

8-1977 Colorfastness to Crocking: AATCC Crockmeter Method[4]

15-1979 Colorfastness to Perspiration

16A-1977 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E-1978 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23-1975 Colorfastness to Burnt Gas Fumes

61-1975 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

96-1975 Dimensional Changes in Laundering of Woven and Knitted Textiles except Wool

116-1977 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124-1978 Appearance of Durable Press Fabrics after Repeated Home Launderings

132-1979 Colorfastness to Drycleaning

135-1978 Dimensional Changes in Automatic Home Launderings of Durable Press Woven of Knit Fabrics

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

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[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] AATCC Technical Manual, available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N.C. 27709.

Evaluation Procedure 1 Gray Scale for Color Change
Evaluation Procedure 2 Gray Scale for Staining
Evaluation Procedure 3 AATCC Chromatic Transference Scale

NOTE 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7 on Test Methods.

3. Terminology

3.1 *Definitions*:

3.1.1 *dimensional change, n.—in pressing and finishing of textiles*, the change in dimensions of a fabric caused by pressing and finishing during garment manufacture.

3.1.2 For definitions of other textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Definitions D 123.

3.2 *Description of Term*:

3.2.1 *pressing and finishing*—this term takes into account all of the industrial pressing and finishing treatments used in garment production.

NOTE 2—No standard method is available for reproducing on a laboratory level the results of industrial pressing or finishing treatments, or both, used in the manufacture of garments.[5]

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics, the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: This fabric meets ASTM Specification D 4154 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer. Any "partially finished" or "post-finished" fabrics should first be processed in accordance with the fabric manufacturer's instructions.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying the method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of fabrics for men's and boys' knitted and woven beachwear and sport shirts shall conform to the specification requirements in Table 1.

7. Test Method (see Note 1)

7.1 *Breaking Strength* (*Load*) (Woven Fabric Only)—Determine the dry breaking strength, in the standard atmosphere for testing textiles, in accordance with the grab test procedure of Method D 1682 – 64 (1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling jaw at 305 ± 13 mm (12 ± 0.5 in.)/min.

NOTE 3—If preferred, the use of a constant-rate-of-extension (CRE tensile testing machine is permitted. The crosshead speed should be agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and with the CRE machine. Consequently, these two breaking load testers should not be used interchangeably. In case of controversy the CRT method shall prevail.

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[5] The development of a standard method has been referred to Subcommittee D13.59 on Fabric Test Methods, General.

7.2 *Bursting Strength* (Knitted Fabric Only)—Determine the bursting strength, in the standard atmosphere for testing textiles, as directed in Method D 3787 – 79 using an approved type of constant-rate-of-traverse (CRT) machine equipped with a bursting attachment or Method D 3786 – 79 using an approved type of diaphragm bursting tester as agreed between the purchaser and the seller.

NOTE 4—There is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphragm bursting tester. Consequently, these two bursting testers cannot be used interchangeably. In case of controversy, the CRT machine equipped with a bursting attachment method shall prevail.

NOTE 5—The precision of the ball burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm bursting tester method are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replicate specimens of the material to be evaluated.

7.3 *Resistance to Yarn Slippage* (Woven Fabric Only)—Determine the resistance to yarn slippage as directed in Method D 434 – 75.

NOTE 6—The precision of Method D 434 – 75 is being established, and it may not be suitable for fabrics with low yarn counts (see 4.2).

7.4 *Tongue Tear Strength* (Woven Fabric Only)—Determine the tongue tear strength as directed in Method D 2262 – 71 (1976).

NOTE 7—If preferred, use of Method D 1424 – 63 (1975) is permitted with existing requirements as given in this standard. There may be no overall correlation between the results obtained with the tongue tear machine and with the Elmendorf machine. Consequently, these two tear testers should not be used interchangeably. In case of controversy, Method D 2262 – 71 (1976) shall prevail.

7.5 *Dimensional Change*:

7.5.1 *Pressing and Curing During Manufacturing*—Mark specimen(s) as directed in Section 4.4 of AATCC Method 135-1978. Press and cure specimen(s) as agreed upon by the purchaser and the seller with respect to time cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Section 6 and 7 of AATCC Method 135-1978 (see Note 2).

7.5.1.1 If no agreement has been made between the purchaser and the seller, press the specimen(s) using a flat-bed steam press according to the cycle in 10.1.4.1 through 10.1.4.5 of Method D 2724 – 78.

7.5.2 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135-1978.

NOTE 8—Launderable fabrics are expected to be drycleanable except where all or part of the fabric is not drycleanable and is so labeled. For example, the fabric could contain a functional finish soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. Goods labeled "drycleanable" are to be drycleaned only.

NOTE 9—Specimens prepared for 7.5.1 may be used for 7.5.2 and 7.5.3 as desired. When this is done, subtract the pressing and curing dimensional change from the total dimensional change to obtain that portion due to laundering or drycleaning. The dimensional change to pressing and curing is determined on the fabric as it will reach the user. It is not to be added to the dimensional change due to laundering or drycleaning of the fabric as it will reach the consumer (see 5.1).

7.5.2.1 The wash conditions and drying procedure shall be as specified by the seller.

7.5.2.2 When the dimensional change after five launderings exceeds 3 %, determine the stretch of the fabric after five launderings as directed in Method D 2594 – 72(1977) using a 2.2-N (0.5-lbf) load. If the difference between the percent stretch of the laundered fabric and the percent shrinkage due to laundering does not exceed 3 % shrinkage, then the fabric meets the specification requirements in Table 1.

7.5.3 *Drycleaning*—Determine the maximum dimensional change after three drycleanings in accordance with Sections 10.1.1 through 10.1.4 of Method D 2724 – 78.

7.5.4 *Growth* (Knitted Fabric Only)—Determine the growth of the fabric as directed in Method D 2594 – 72 (1977).

7.6 *Colorfastness*:

7.6.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23-1975.

NOTE 10—Washing conditions shall be the same as those used in 7.5.2.1. Drycleaning conditions shall be the same as those used in 7.5.3.

7.6.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61-1975. The test conditions shall be as specified by the seller (see Note 7).

7.6.3 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132-1979 (see Note 8).

7.6.4 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8-1977 for solid shades and AATCC Method 116-1977 for prints or as agreed between the purchaser and the seller.

7.6.5 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15-1979.

7.6.6 *Light*—Determine colorfastness to light as directed in AATCC Method 16A-1977 or AATCC Method 16E-1978.

NOTE 11—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine carbon-arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1978 shall prevail.

7.7 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124-1978 after laundering using the wash-and-wear cycle or the normal cycle as agreed between the purchaser and the seller as specified in Section 7.5.2.1 for washable fabrics or after drycleaning as specified in Section 7.5.3 for drycleanable fabrics (see Note 8).

7.7.1 For fabrics not intended for use in "durable press" garments, determine the fabric smoothness after pressing as specified in Section 5.12 of AATCC Method 96-1975.

7.7.1.1 The fabric smoothness (DP) rating of such fabrics, and the DP rating of drycleaned fabrics, shall have decreased no more than ½ DP rating from that of the fabric before it is laundered or drycleaned.

7.8 *Flammability*—The flammability requirements shall be agreed between the purchaser and the seller, except when regulated by applicable Federal mandatory standards.

TABLE 1 Specification Requirements

NOTE—Class for colorfastness and DP rating is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for very severe color change, color transfer or wrinkle. The numerical rating in Table 1 or a higher numerical rating is acceptable.

Characteristic	Requirements		Section
	Knitted	Woven	
Breaking strength (load) (CRT)	...	111 N (25 lbf), min	7.1
Bursting strength (load) (ball burst)	222 N (50 lbf)	...	7.2
Yarn slippage, 6-mm (¼-in.) separation	...	89 N (20 lbf), min	7.3
Tongue tear strength	...	6.7 N (1.5 lbf), min	7.4
Dimensional Change:			
Pressing and finishing	2 % max	1 % max, pre-finished fabrics	7.5.1
After five launderings (see 7.5.2.2 if shrinkage exceeds 3 %)	3 % max	2 % max, post-finished fabrics	7.5.2
After three drycleanings	3 % max	3 % max	7.5.3
Growth	3 % max	3 % max	7.5.4
Colorfastness:			
Burnt Gas Fumes—2 Cycles:			
Shade change, original fabric	Class 4[A] min	Class 4[A] min	7.6.1
Shade change after 1 laundering or 1 drycleaning	Class 4[A] min	Class 4[A] min	
Laundering:			
Shade change	Class 4[A] min	Class 4[A] min	7.6.2
Staining	Class 3[B] min	Class 3[B] min	
Drycleaning:			
Shade change	Class 4[A] min	Class 4[A] min	7.6.3
Crocking:			
Dry	Class 4[C] min	Class 4[C] min	7.6.4
Wet	Class 3[C] min	Class 3[C] min	
Perspiration			
Shade Change	Class 4[A] min	Class 4[A] min	7.6.5
Staining	Class 3[B] min	Class 3[B] min	
Light (40 AATCC FU) (xenon-arc)	Step 4[A] min	Step 4[A] min	7.6.6
Fabric appearance (see 7.7.1.1)	DP 3.5[D] min	DP 3.5[D] min	7.7
Flammability	pass	pass	7.8

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] For durable press fabrics only.

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Standard Performance Specification for
WOMEN'S AND GIRLS' WOVEN SPORTSWEAR, SHORTS, SLACKS, AND SUITING FABRICS[1]

This standard is issued under the fixed designation D 4155; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers woven fabrics for women's and girls' sportswear, shorts, slacks, and suitings.

1.2 These requirements apply to both the length and width directions for those properties where fabric direction is pertinent.

1.3 This performance specification is not applicable to woven fabrics used for interlinings, jeans, and dungarees.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Related to Textiles[2]
D 434 Test for Resistance to Slippage of Yarns in Woven Fabrics Using a Standard Seam[3]
D 1424 Test for Tear Resistance of Woven Fabrics by Falling Pendulum (Elmendorf) Apparatus[3]
D 1682 Test for Breaking Load and Elongation of Textile Fabrics[3]
D 2261 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Extension Tensile Testing Machine)[3]
D 2262 Test for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Traverse Tensile Testing Machine)[3]
D 2724 Testing Bonded and Laminated Apparel Fabrics[3]
D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of a Textile Material[3]

2.2 *AATCC Methods*:[4]

8 Colorfastness to Crocking—AATCC Crockmeter Method
15 Colorfastness to Perspiration
16A Colorfastness to Light: Carbon-Arc Lamp, Continuous Light
16E Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light
23 Colorfastness to Burnt Gas Fumes
61 Colorfastness to Washing, Domestic and Laundering, Commercial Accelerated
116 Colorfastness to Crocking; Rotary Vertical, Crockmeter Method
119 Color Change Due to Flat Abrasion (Frosting): Screen Wire Method
124 Appearance of Durable Press Fabrics after Repeated Home Laundering
132 Colorfastness to Dry Cleaning
135 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics
Evaluation Procedure 1 Gray Scale for Color Change
Evaluation Procedure 2 Gray Scale for Staining
Evaluation Procedure 3 AATCC Chromatic Transference Scale

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved July 30, 1982. Published September 1982.

[2] *Annual Book of ASTM Standards*, Parts 32 and 33.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] Available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N. C. 27709.

NOTE 1—The specific dated editions of the ASTM test methods that prevail in this document are referenced in Section 7 on Test Methods.

3. Definitions

3.1 For definitions of textile terms used in this specification, refer to the individual ASTM and AATCC test methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4155 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specifications Requirements

6.1 The properties of woven fabrics for women's and girls' sportswear, shorts, slacks, and suitings shall conform to the specification requirements in Table 1.

7. Test Methods (see Note 1)

7.1 *Breaking Strength* (Load)—Determine the dry breaking strength (load) as directed in the grab test of Method D 1682 – 64 (1975), using a constant-rate-of-traverse (CRT) tensile testing machine with the speed of the pulling clamp at 305 ± 13 mm (12 ± ½ in.)/min.

NOTE 2—If preferred, the use of a constant-rate-of-extension (CRE) testing machine is permitted. The crosshead speed should be as agreed between the purchaser and the seller. There may be no overall correlation between the results obtained with the CRT machine and the CRE machine, consequently, these two breaking load testers cannot be used interchangeably. In case of controversy, the CRT machine will prevail.

7.2 *Resistance to Yarn Slippage*—Determine the resistance to yarn slippage as directed in Method D 434 – 75.

NOTE 3—The precision of Method D 434 – 75 is being established, and it may not be suitable for fabrics with low yarn counts in terms of ends and picks per inch (see 4.2).

7.3 *Tear Strength*—Determine the tear strength as directed in Method D 2262 – 71 (1976).

NOTE 4—If preferred, the use of Methods D 1424 – 75 and D 2261 – 71 (1976) is permitted with existing requirements as given in this standard. There may be no overall correlation between the results obtained with the tongue tear machines and the Elmendorf machine. Consequently these tear testers cannot be used interchangeably. In case of controversy, Method D 2262 – 71 (1976) shall prevail.

7.4 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124 – 1978 after laundering using the wash-and-wear cycle or the normal cycle as agreed between the purchaser and the seller as specified in 7.6.2 for washable fabrics or after drycleaning as specified in 7.6.3 for drycleanable fabrics (see Note 5).

7.4.1 For fabrics not intended for use in "durable press" garments determine the fabric smoothness after pressing as specified in Section 10.2.5 of Method D 2724 – 1479.

7.4.1.1 The fabric smoothness durable press (DP) rating of such fabrics, and the DP rating of drycleaned fabrics, shall have decreased no more than ½ DP rating from that of the fabric before it is laundered or drycleaned.

7.5 *Colorfastness*:

7.5.1 *Burnt Gas Fumes*—Determine the colorfastness to burnt gas fumes (on the original fabric and after one laundering or one drycleaning) as directed in AATCC Method 23 – 1975 after 1 cycle.

7.5.2 *Laundering*—Determine the colorfastness to laundering as directed in AATCC Method 61 – 1980. The test conditions shall be as agreed between the purchaser and seller (see Note 5).

7.5.3 *Drycleaning*—Determine the colorfastness to drycleaning as directed in AATCC Method 132 – 1979.

NOTE 5—Launderable fabrics are expected to be drycleanable except where all or part of the fabric is not drycleanable and is so labeled. For example, the fabric could contain a functional finish soluble in the solvent, or the fiber could be degraded by the solvent, as would be the case with poly(vinyl chloride) fiber. Goods labeled "drycleanable" are to be drycleaned only.

7.5.4 *Perspiration*—Determine the colorfastness to perspiration as directed in AATCC Method 15 – 1979.

7.5.5 *Light*—Determine the colorfastness to light as directed in AATCC Method 16A – 1977 or AATCC Method 16E – 1978.

NOTE 6—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E-1978 shall prevail.

7.5.6 *Crocking*—Determine the colorfastness to crocking as directed in AATCC Method 8 – 1977 for solid shades and AATCC Method 116 – 1977 for prints, or as agreed between the purchaser and the seller.

7.5.7 *Frosting*—Determine the colorfastness to flat abrasion as directed in AATCC Method 119 – 1979.

7.6 *Dimensional Change*:

7.6.1 *Pressing and Finishing During Manufacturing*—Mark specimen(s) as directed in Section 4.4 of AATCC Method 135 – 1978. Press and finish specimen(s) as agreed upon by the purchaser and the seller with respect to time cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135 – 1978 (see Note 2).

7.6.1.1 If no agreement has been made between the purchaser and the seller, press the specimen(s) using a flat-bed steam press and using a cycle as directed in 10.1.4.1 through 10.1.4.5 of Method D 2724 – 79.

7.6.2 *Laundering*—Determine the maximum dimensional change after five launderings as directed in the applicable procedure in AATCC Method 135 – 1978 or as agreed between the purchaser and the seller (see Notes 5 and 7).

7.6.2.1 The wash conditions and drying procedure shall be as specified by the seller.

NOTE 7—Specimens prepared for 7.6.1 may be used for 7.6.2 and 7.6.3 as desired. When this is done, the dimensional change due to laundering or drycleaning is calculated using Eq 1. The dimensional change to pressing is determined on the fabric as it will reach the user. It is not additive to the dimensional change to laundering or drycleaning of the fabric as it will reach the consumer (see 5.1).

$$\text{Percent Dimensional Change} = 100\,(D_1 - D_2)/D_2 \quad (1)$$

where:

D_1 = measurement after laundering or drycleaning, and

D_2 = measurement after pressing and finishing.

7.6.3 *Drycleaning*—Determine the maximum dimensional change after three drycleanings as directed in Section 10.1.1 thru 10.1.5 of Method 2724 – 79 or as agreed between the purchaser and the seller.

7.7 *Flammability*—The flammability requirements shall be agreed upon by the purchaser and the seller, except when regulated by applicable Federal mandatory standards.

TABLE 1 Specification Requirements

NOTE—Class for colorfastness and durable press (DP) rating is based on a numerical scale of 5 for negligible or no color change, color transfer, or wrinkle to 1 for very severe color change, color transfer, or wrinkle.

Characteristics	Requirements	Section
Breaking strength (load) CRT[E]		7.1
Worsted and cotton count yarns:		
Warp	155 N (35 lbf) min	
Filling	133 N (30 lbf) min	
Woolen run yarns, each direction	111 N (25 lbf) min	
Yarn slippage, 6.3-mm (¼-in.) separation at	89 N (20 lbf) min	7.2
Tongue tear strength	8.9 N (2.0 lbf) min	7.3
Fabric appearance (see 7.4.1.1)	DP 3.5[A] min	7.4
Colorfastness:		
Burnt gas fumes—1 cycle		7.5.1
Shade change, original fabric	Class 4[B] min	
Shade change, after one laundering or one drycleaning	Class 4[B] min	
Laundering:		
Shade change	Class 4[B] min	7.5.2
Staining	Class 3[C] min	
Drycleaning:		
Shade change	Class 4[B] min	7.5.3
Perspiration:		
Shade change	Class 4[B] min	7.5.4
Staining	Class 3[C] min	
Light (20 AATCC FU) (xenon-arc)[E]	Step 4[B] min	7.5.5
Crocking:		
Dry	Class 4[D] min	7.5.6
Wet	Class 3[D] min	
Frosting:		
Shade change	Class 4[B] min	7.5.7
Dimensional change:		7.6
Pressing and finishing	2 % max	7.6.1
Laundering	3 % max	7.6.2
Drycleaning	2 % max	7.6.3
Flammability	pass	7.7

[A] For durable press fabrics only.

[B] AATCC Gray Scale for Color Change.

[C] AATCC Gray Scale for Staining.

[D] AATCC Chromatic Transference Scale.

[E] More than one method can be used to measure these properties. These methods cannot be used interchangeably, since there may be no overall correlation between them (see Notes 2, 4, and 6).

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.

Designation: D 4156 – 82

Standard Performance Specification for WOMEN'S AND GIRLS' KNITTED SPORTSWEAR FABRICS[1]

This standard is issued under the fixed designation D 4156; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This performance specification covers women's and girls' knitted sportswear fabrics composed of any fiber or mixture of textile fibers.

1.2 These requirements apply to the length and width directions for those properties where each fabric direction is pertinent.

2. Applicable Documents

2.1 *ASTM Standards*:

D 123 Definitions of Terms Relating to Textiles[2,3]

D 2594 Test for Stretch Properties of Knitted Fabrics Having Low Power[2]

D 2724 Testing Bonded and Laminated Apparel Fabrics[2]

D 2905 Practice for Statements on Number of Specimens Required to Determine the Average Quality of Textiles[2]

D 3786 Test for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method[2]

D 3787 Test for Bursting Strength of Knitted Goods: Constant-Rate-of-Traverse (CRT), Ball Burst Test[2]

NOTE 1—The specific dated edition of ASTM test methods that prevail in this document are referenced in Section 7 on Test Methods.

2.2 *AATCC Methods*:[4]

8 – 1977 Colorfastness to Crocking: AATCC Crockmeter Method

15 – 1979 Colorfastness to Perspiration

16A – 1977 Colorfastness to Light: Carbon-Arc Lamp, Continuous Light

16E – 1978 Colorfastness to Light: Water-Cooled Xenon-Arc Lamp, Continuous Light

23 – 1975 Colorfastness to Burnt Gas Fumes

61 – 1980 Colorfastness to Washing, Domestic, and Laundering, Commercial: Accelerated

116 – 1977 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

124 – 1978 Appearance of Durable Press Fabrics after Repeated Home Launderings

132 – 1979 Colorfastness to Drycleaning

135 – 1978 Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabrics

Evaluation Procedure 1 Gray Scale for Color Change

Evaluation Procedure 2 Gray Scale for Staining

Evaluation Procedure 3 AATCC Chromatic Transference Scale

3. Definitions

3.1 *sheer, n*—a fabric that is transparently thin or diaphanous.

3.1.1 There is no clear distinction between sheer fabrics and nonsheer fabrics. The purchaser and the seller should agree in advance as to which category a fabric is to be classified.

3.2 For definitions of other textile terms used in this specification, refer to the individual

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[1] This specification is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.56 on Performance Standards for Textile Fabrics.

Current edition approved July 30, 1982. Published September 1982.

[2] *Annual Book of ASTM Standards*, Part 32.

[3] *Annual Book of ASTM Standards*, Part 33.

[4] Available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, N. C. 27709.

ASTM and AATCC test methods and to Definitions D 123.

4. Uses and Significance

4.1 Upon mutual agreement between the purchaser and the seller, fabrics intended for this end use should meet all of the requirements listed in Table 1 of this specification.

4.2 It is recognized that for purposes of fashion or aesthetics the ultimate consumer of articles made from these fabrics may find acceptable fabrics that do not conform to all of the requirements in Table 1. Therefore, one or more of the requirements listed in Table 1 may be modified by mutual agreement between the purchaser and the seller.

4.2.1 In such cases, any references to the specification shall specify that: "This fabric meets ASTM Specification D 4156 except for the following characteristic(s)."

4.3 Where no prepurchase agreement has been reached between the purchaser and the seller, and in case of controversy, the requirements listed in Table 1 are intended to be used as a guide only. As noted in 4.2, ultimate consumer demands dictate varying performance parameters for any particular style of fabric.

4.4 The uses and significance of particular properties and test methods are discussed in the appropriate sections of the specified test methods.

5. Sampling

5.1 Tests shall be performed on the fabric as it will reach the consumer.

5.2 Unless otherwise agreed upon, as when specified in an applicable material specification, take the number of specimens directed in each of the applicable test methods.

5.2.1 If there has been no prior agreement and the test method does not specify the number of specimens, use the procedures in Practice D 2905 to determine the number of specimens, such that the user may expect at the 95 % probability level that the test result is no more than 5 % of the average above or below the lot average (that is, the average that would be obtained by applying this method to the entire lot) when using a reliable estimate of variability of individual observations on similar materials in the user's laboratory under conditions of single-operator precision.

6. Specification Requirements

6.1 The properties of knitted fabrics for women's and girls' sportswear shall conform to the specification requirements in Table 1.

7. Test Methods (see Note 1)

7.1 *Bursting Strength*—Determine the bursting strength as directed in Methods D 3786 – 79 or D 3787 – 79 as agreed between the purchaser and the seller.

NOTE 2—Care should be taken to subtract the tare diaphragm pressure from the gross pressure to obtain actual bursting strength of fabric when using the diaphragm bursting tester. Calibrate the equipment according to the manufacturer's instruction before use. Since there is no overall correlation between the results obtained with the CRT machine equipped with a bursting attachment and the diaphragm bursting tester, these two bursting testers cannot be used interchangeably. In case of controversy, the CRT machine equipped with a bursting attachment method shall prevail.

NOTE 3—The precision of the ball burst method using the CRT machine equipped with a bursting attachment and the precision of the diaphragm bursting tester method are being established by Subcommittee D13.59. The methods are accordingly not recommended for acceptance testing unless preceded by an interlaboratory check test in the laboratory of the purchaser and the laboratory of the seller using randomized replica specimens of the type of material to be evaluated.

7.2 *Dimensional Change*:

7.2.1 *Pressing and Finishing During Garment Manufacturing*—Mark specimen(s) as directed in Section 4.5 of AATCC Method 135 – 1978. Press and finish specimen(s) as agreed upon by the purchaser and the seller with respect to time cycles, temperature, steam, vacuum, and mechanical pressure of the press head. Measure the specimen(s) and calculate the dimensional change as directed in Sections 6 and 7 of AATCC Method 135 – 1978 (see Note 4).

7.2.1.1 If no agreement has been made between the purchaser and the seller, press the specimen(s) using a flat-bed steam press according to the cycle in 10.1.4 through 10.1.4.5 of Method D 2724 – 79.

NOTE 4—No standard method is available for reproducing on a laboratory level the results of industrial press or finish treatments, or both, used in the manufacture of sportswear from knitted fabrics.[5]

7.2.2 *Laundering*—Determine the maximum dimensional change after five launderings or as agreed between the purchaser and the seller as directed in the applicable procedure in AATCC Method 135 – 1978 (see Notes 5 and 6).

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[5] The development of a standard method has been referred to Subcommittee D13.59 on Fabric Test Methods, General.

7.2.2.1 The wash conditions and drying procedure shall be as specified by the seller.

7.2.1.2 When the dimensional change after five launderings exceeds 3 %, determine the stretch of the fabric after five launderings as directed in Method D 2594 – 72 (1977) using 2.2-N (0.5-lbf) load. If the difference between the percent stretch of the laundered fabric and the percent shrinkage due to laundering does not exceed 3 % shrinkage then the fabric meets the specification requirement in Table 1.

7.2.3 *Drycleaning*—Determine the maximum dimensional change after three drycleanings or as agreed between the purchaser and the seller in accordance with Sections 10.1.1 through 10.1.5 of Method D 2724 – 79 (Notes 5 and 6).

NOTE 5—Launderable fabrics are expected to be drycleanable except where all or part of the fabric is not drycleanable and is so labeled. For example, the fabric could contain a functional finish soluble in the solvent, or the fiber could be degraded by the solvent, which would be the case with poly(vinyl chloride) fiber. "Drycleanable" goods are to be drycleaned only.

NOTE 6—Specimens prepared for 7.2.1 may be used for 7.2.2 and 7.2.3 as desired. When this is done the dimensional change due to laundering or drycleaning is calculated using Eq 1. The dimensional change to pressing and finishing is determined on the fabric as it will reach the user. It is not additive to the dimensional change to laundering or drycleaning of the fabric as it will reach the consumer (see 5.1).

$$\text{Percent Dimensional Change} = 100\,(D_1 - D_2)/D_2 \qquad (1)$$

where:

D_1 = measurement after laundering or drycleaning, and

D_2 = measurement after pressing and finishing.

7.3 *Colorfastness*:

7.3.1 *Burnt Gast Fumes*—Determine the colorfastness to burnt gas fumes on the original fabric and after one laundering or one drycleaning as directed in AATCC Method 23 – 1975 after 2 cycles.

NOTE 7—Washing conditions shall be the same as those used in 7.2.2.1. Drycleaning conditions shall be the same as those used in 7.2.3.

7.3.2 *Laundering*—Determine the colorfastness to laundering as directed in the applicable procedure of AATCC Method 61 – 1980. The test conditions shall be as specified by the seller (see Note 6).

7.3.3 *Drycleaning*—Determine colorfastness to drycleaning as directed in AATCC Method 132 – 1979 (see Note 6).

7.3.4 *Crocking*—Determine colorfastness to dry and wet crocking as directed in AATCC Method 8 – 1979 for solid shades and AATCC Method 116 – 1979 for prints or as agreed between the purchaser and the seller.

7.3.5 *Perspiration*—Determine colorfastness to perspiration as directed in AATCC Method 15 – 1979.

7.3.6 *Light*—Determine colorfastness to light as directed in AATCC Method 16A – 1977 or AATCC Method 16E – 1978.

NOTE 8—There is a distinct difference in spectral distribution between the xenon fading lamp apparatus and the enclosed carbon-arc (not sunshine-carbon arc). Consequently, these two fading lamp apparatus cannot be used interchangeably since there is no overall correlation between them. In case of controversy, AATCC Method 16E – 1978 shall prevail.

7.4 *Fabric Appearance*—Determine the fabric appearance as directed in AATCC Method 124 – 1978 after laundering using the wash-and-wear cycle or the normal cycle as agreed between the purchaser and the seller as specified in 7.2.1.1 for washable fabrics or after drycleaning as specified in 7.2.2 for drycleanable fabrics (see Note 4).

7.4.1 For fabrics not intended for use in durable press garments determine the fabric smoothness after pressing as specified in Section 10.2.5 of Method D 2724 – 1479.

7.4.1.1 The fabric smoothness durable press (DP) rating of such fabrics, and the DP rating of drycleaning fabrics shall have decreased no more than ½ DP rating from that of the fabric before it is laundered or drycleaned.

7.5 *Flammability*—The flammability requirements shall be as agreed between the purchaser and the seller, except when regulated by applicable Federal mandatory standards.

TABLE 1 Specification Requirements

NOTE—Class in colorfastness is based on a numerical scale of 5 for negligible color change or color transfer to 1 for very severe color change or color transfer.

Characteristic	Requirements		Section
	Sheer Fabric	Nonsheer Fabrics	
Bursting strength (ball burst)[D]	133 N (30 lbf), min	222 N (50 lbf), min	7.1
Dimensional change:			
Pressure and finishing	2 % max	2 % max	7.2.1
Laundering (see 7.2.2.2)	3 % max	3 % max	7.2.2
Drycleaning	3 % max	3 % max	7.2.3
Colorfastness:			
Burnt gas fumes, 2 cycles:			7.3.1
Shade change, original	Class 4[A] min	Class 4[A] min	
Shade change, after laundering or one drycleaning	Class 4[A] min	Class 4[A] min	
Laundering:			7.3.2
Shade change	Class 4[A] min	Class 4[A] min	
Staining	Class 3[B] min	Class 3[B] min	
Drycleaning:			7.3.3
Shade change	Class 4[A] min	Class 4[A] min	
Crocking:			7.3.4
Dry	Class 4[C] min	Class 4[C] min	
Wet	Class 3[C] min	Class 3[C] min	
Perspiration			7.3.5
Shade change	Class 4[A] min	Class 4[A] min	
Staining	Class 3[B] min	Class 3[B] min	
Light (40AATCC FU) (xenon-arc)	Step 4[A] min	Step 4[A] min	7.3.6
Fabric appearance (see 7.4.1.1)	DP 3.5 min	DP 3.5 min	7.4
Flammability	pass	pass	7.5

[A] AATCC Gray Scale for Color Change.

[B] AATCC Gray Scale for Staining.

[C] AATCC Chromatic Transference Scale.

[D] There is more than one standard method that can be used to measure bursting strength, and lightfastness. These methods cannot be used interchangeably since there may be no overall correlation between them (see Notes 2, 3, and 8).

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